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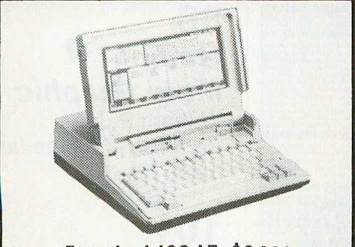

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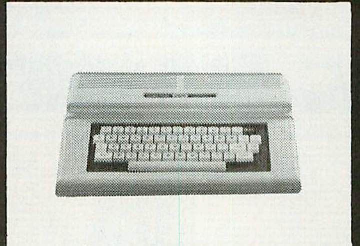

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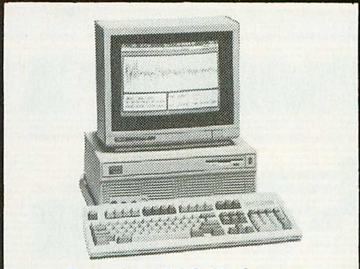

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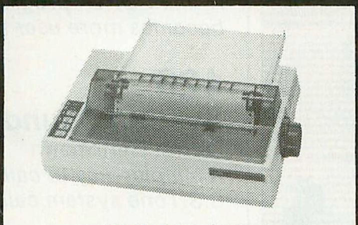

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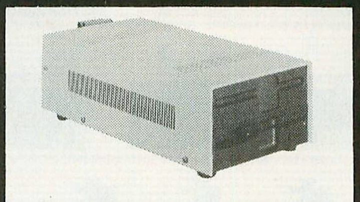

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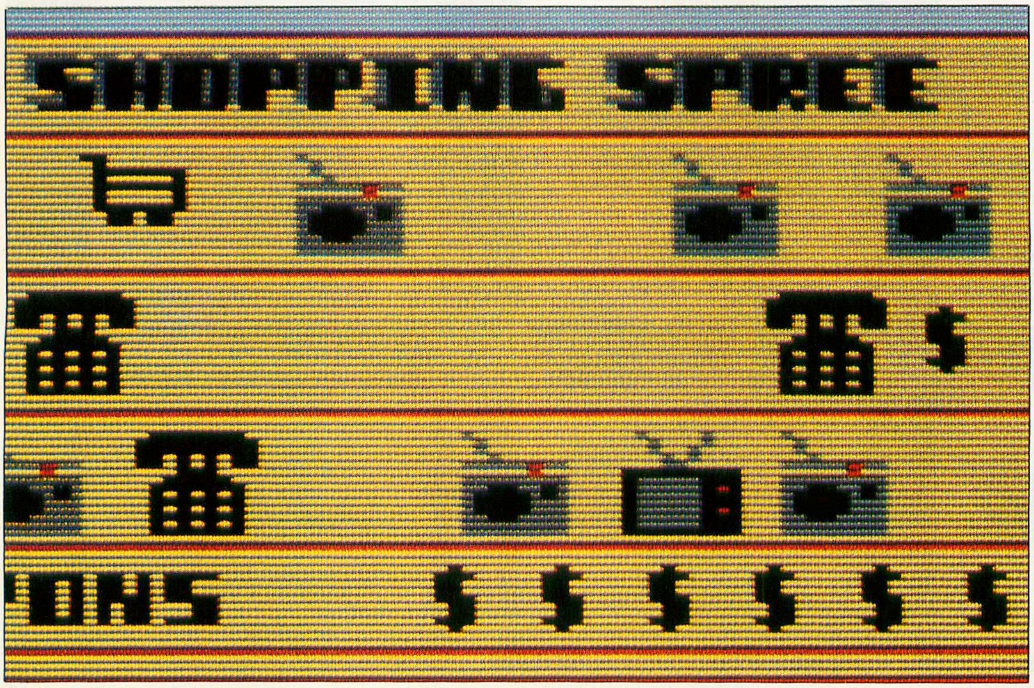

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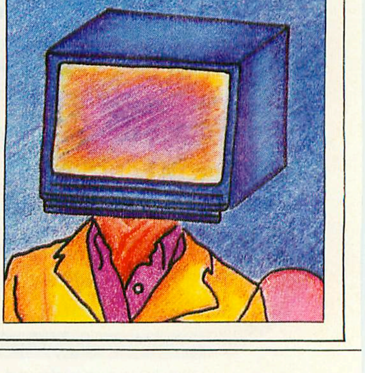

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Letters to the RAINBOW

BACK TALK

Editor:

Some time ago I wrote to you regarding the problem that seems to exist in the CoCo world — in Europe, North America, and here in Australia. Your editorial in the April issue ("Print #-2," Page 10) seems to underline rather than allay this.

INTERTAN Australia continues to carry the CoCo, but rumors of them getting out of the computer business are rife, and till now no confirmation or denial has been forthcoming.

I told you about my own experience in Europe and the United Kingdom, where Tandy Europe decided not to carry the CoCo. Canada is now next in line. Whatever strength the exchange rates argument may carry to support INTERTAN Canada's decision, I still think the average Canadian would prefer to buy locally where he has his local Tandyman available for support.

Any CoCo software or peripherals advertised in RAINBOW are readily available here in Australia. The real prices are considerably higher than I would pay if I ordered from a U.S. dealer, but I and many others prefer to buy here simply because of guarantee and support considerations.

The assurance that INTERTAN here or there will "continue to support the CoCo" just isn't good enough. I have invested in software and peripherals and want assurance that when my CoCo 3 has had its day, a replacement will be available. In fact, I think that in Europe, the United Kingdom, Canada and the United States, there are not and never have been enough CoCos to provide a wide enough market and repeat market basis.

Witness your own magazine — the extra pages promised the middle of last year have never eventuated. If Tandy really wants to sell CoCos or any other Tandy computers, I suggest it abandon their policy of selling only through their own or specifically franchised outlets, and get its computers on display and in competition with the Commodores and Ataris in the department and electronics stores where the average computer buyer shops.

In addition, a little public relations via the media would do no harm. Each of the two most-read morning newspapers here in Sydney has a large computer section once a week, and anything new in the way of software or peripherals for Commodore, Atari and IBM gets an objective editorial review. Pre-Christmas, by popular request, one newspaper devoted a lot of space to a rundown on what was available for the prospective down-market home computer buyer. The journalist later repeated what he said on a national prime-time television program. But guess which home computer did not get a mention!

Keiran Kenny
Cremorne NSW, Australia

Wrongful Death

Editor:

The news about our "death" was greatly exaggerated. I am referring to Mr. Norman Thode's letter in the May issue of RAINBOW, where he says that we are no longer in business.

We *are* in business, but two and a half years ago we moved to a bigger location. The post office steadfastly refuses to redeliver old mail to a new address after 12 months. We have tried to have letters mailed to the old address redirected to us or to a P.O. Box, but to no avail.

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Print Backwards

Editor:

Upon reading your April 1989 article on word processors for the Color Computer ("Deciding What's Write for You," Page 26), I noticed you failed to mention a very important feature found only in the OS-9 word processor *Dynastar* (Page 4). It has the ability to print documents backward. Oddly enough, this feature is not mentioned in the manual. Can anyone tell me how to use this feature?

Robert Moy
316 6th Street #9
New York, NY 10003

Radio Man Sights Plane Error

Editor:

I enjoy the graphics in "CoCo Gallery," but noticed a small error in the June 1988 issue, Page 34. The plane is not a North American P-51. It looks more like a Curtis P-40. The lower part of the fuselage under the engine is larger than on a P-51, which is more streamlined. Also, you can't put a single belly tank on a P-51. It requires two. The vertical empennage on the P-51 is more rectangular than the picture.

The P-51 was much more widely known with the Bubble Canopy. The type of canopy in the picture was used on P-51s before the D-model, which was produced and used in larger numbers.

This error interested me because I was a radio man in the 308th Fighter Squadron of the 31st Fighter Group, during World War II. The 31st was the top scoring group in the Mediterranean Theatre, having shot down 573 enemy planes.

Arthur B. Davenport
Melbourne, Florida

INFORMATION PLEASE

Editor:

Albert Schriefer's letter (May '89, Page 6) regarding *DeskMate 3*'s conversion works fine except I don't have printer capabilities. Is there any information that got left out?

Hadley J. Hazen
Thornton, Colorado

Whenever you config a new OS-9 disk, you must select the P *device from the first screen if you anticipate using a printer.*

Triple Trouble

Editor:

How do you get Joesph Kolar's three *Flight* programs, (May '89, Page 88) to run on a CoCo3? The program stops on Line 110 with an FC (Function Call) Error. How do you type three listings in — one at a time or all together? I am new with computers and will appreciate any help I can get?

Alta Irana
Tempe, Arizona

As listed, the Flight *programs should work as mentioned in the aritcle. Recheck your typing through the listing. Multiple listings should be entered and saved separately.*

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by Walter Bayer

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CLOAD Protection

Editor:

I have a 64K ECB CoCo 2 with a cassette recorder. Is there a way to protect a program from being modified or `LLIST`ed? If so, how would I go about doing this?

Michael T. Lawrence
Winton, California

See "Do You Have a Question" (January '89, Page 53) for a BREAK *protection routine. To prevent a* `LIST`*, enter* `POKE 383,158`.

Easing Into the System

Editor:

I've decided to try to learn how to use OS-9. What would be the best way to get started so I won't get discouraged and quit? I have a CoCo 3 with two disk drives and a DMP-105 printer. I have purchased OS-9 Level II, but so far I feel confused with the whole thing and am looking for a good way to ease into the system. Please help.

Eric Thompson
Cape Girardeau, Missouri

See next month's issue for Jeffrey Parker's article, "Getting Started with OS-9."

At Your Service

Editor:

I am writing for information about ordering from Radio Shack's National Parts. I need to order some ICs and was told that the part number is no longer good. I have obtained the part numbers from *The Tandy Service Manual*, so I suspect they are correct. I have even given them the generic IC number, but to no avail. Perhaps there is a secret to ordering parts that Radio Shack managers are unwilling to tell me.

The ICs in question are a floppy disk controller, WD-1773-PH (Radio Shack #MS-6429) and the D.A.C., SC-77526-P (Radio Shack #MS6201).

I thank you for any light you can shed on the subject.

Herbert Enzman
432 Patuxent Road
Odenton, MD 21113

Parts can be ordered from Tandy National Parts only through your local Radio Shack by supplying the catalog number for the main product (e.g., #26-3029 disk controller). We suggest that you order during Fort Worth business hours and prepay your order. This ensures that the order is placed properly.

Baseball Program Needed

Editor:

Is there a baseball statistics program or a baseball card collections program available for the CoCo 3 and DMP-130 printer?

Pat Norris
16436 SR 231
Nevada, OH 44849

Check out Fun Stats *(June 1989, Page 110).*

CoCo Loyalty

Editor:

It took me over a year before deciding which low-end computer to buy a few years ago. I took the gamble on the CoCo rather than Commodore or Atari because of *Telewriter-64*. I wasn't disappointed.

Now I'm ready to move on to the CoCo 3 plus *Telewriter-128*, and go whole hog with disk drives, digital monitor, faster modem — the works. However, if THE RAINBOW doesn't think a CoCo word processor is good enough to produce its editorial content, is there any point? Why don't we all just switch to MS-DOS and buy your other magazine?

I feel very strongly that as a sign of faith to your loyal readership and the computer you support, you *must* stay with the CoCo, using *all* the available word processors and hard disks. Your constant use of the programs will lead to their improvement, just as dedicated *Telewriter* fans produced the many patches over the years.

William Condie
Freehold, New Jersey

Of course a Color Computer is "good enough" to produce our editorial content. In fact, CoCos are used to produce something on the order of 75 to 80 percent of all editorial copy that appears in THE RAINBOW*. This includes material submitted by authors, material that we produce ourselves, and program listings.*

However, since going to a new typesetting operation, the text files must pass through our network and into our PostScript typesetter. These are functions we simply cannot do on a Color Computer.

This system allows us to take text files produced on the Color Computer (or, for that matter, an MS-DOS system), produce typeset-quality galley proofs on plain paper through laser printers, "pass copy around" electronically and, finally, do the kind of complicated page layout necessary to produce a magazine the size of RAINBOW *with the kind of quality you expect.*

HINTS & TIPS

Editor:

I have discovered a subroutine in *Cyrus Chess* (Cat. No. 26-3064) which devises a checksum arrangement that prevents the program from operating in RAM, or from disk. The subroutine, which occupies $C842 to $C851, does not seem to have any function in *Cyrus*. By making the following patch: `$C842 20 0E BRA $C852`, I was able to save *Cyrus* off to tape and to disk, and it executed properly. My CoCo is a 64K "F" board. Since a checksum was devised to prevent execution in RAM, CoCo 3 owners should at least give my patch a try.

Cyrus Chess, like most Tandy ROM Paks, is not relocatable. I used a program devised by Richard Esposito and Ralph Ramhoff to save ROM Paks to disk and relocate them back for execution.

Bill Kreamer
Troy, New York

REVIEWING REVIEWS

Editor:

I want to express complete agreement with Dave Otis' comments (May '89, Page 8) on Jim Issel's review of *Max-10*, and to add a caveat for owners of Radio Shack DMP-110 printers. The program is indeed a versatile text editor with a very slow text printout compared with those character-based using the printer's ROM.

Colorware's advertisement lists the DMP-110 as one of *Max-10*'s supported printers, but this is not completely true. With this printer the program works, but not as set forth in the owner's manual. I called Colorware's attention to the fact that the printed page did not match the depiction on screen (the dotted line signaling the end of the page and the Page Preview) because of an overly-long printout beyond the end-of-page perforation on fanfold paper. They stated that this was "normal" with the DMP-110 and they did not contemplate program changes to correct it. Ap-

Word Power 3.2

"... Just think of any word processing feature---chances are very likely that *Word Power* has it ... packs a lot of features ... excellent word processor..." --- **Rainbow's Word Processor Comparison Article** *"Deciding What's Right For You"* April 1989 Rainbow: Page 26.

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PRINTING

Word Power 3.2 drives almost any printer (DMP, EPSON, GEMINI, OKIDATA, etc). Allows options such as baud rates, line spacing, page/print pause, partial print, page numbering/placement, linefeeds, multi-line headers/footers, right justification & number of copies. The values of these parameters & margins can be changed anytime in the text by embedding Printer Option Codes. The **WHAT YOU SEE IS WHAT YOU GET** feature allows you to preview the text on the screen as it will appear in print. You can view margins, page breaks, justification & more.

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UPS 2ND DAY AIR

parently the difficulty is that the DMP-110 uses graphic linefeeds based on 60ths of an inch, while other printers are based on linefeeds of 72nds of an inch.

To Colorware's credit they offered to refund my purchase price. I have since acquired a Star NX-1000, which works perfectly with *Max-10*, albeit painfully slow on text printout as Dave Otis noted. DMP-110 owners be forewarned if your documents run to more than three quarters of a page.

George Q. Slocum
Ossining, New York

REQUEST HOTLINE

Editor:

Please try to include a few more programs for small business people in upcoming issues. (Printer output is imperative.) An excellent example would be something like a disk-based estimation program for a small-time handyman, electrician or plumber.

The program should input such variables as the price of materials, labor, hours to accomplish a certain task, projections as to profit expected, and "what if" calculations, along with state and federal tax charges to both screen and printer.

The Color Computer is underrated and I believe such a program would show it off.

Allan Smith
Jasper, Tennessee

A Plea for Help

Editor:

I have a suggestion for an interesting and helpful tutorial. It may appeal to many of your readers, particularly since your magazine has become so involved with DELPHI.

I enrolled in DELPHI when it was first presented in THE RAINBOW. I fooled around with it a little, used up the free time and quickly became "lost". Then I just forgot about it. Then about a year ago, my son bought himself a Tandy 1000 and became involved with DELPHI through the literature included in the computer box. He has a degree in Computer Science, so he didn't get lost, and in the process of exploring it, came across TQ. We quickly became addicts. This brought to mind the fact that I had enrolled in DELPHI previously, so I dragged the stuff out and tried to get involved again. I am doing better with it this time, but am still pretty "lost" except for the simpler things.

Why couldn't someone from your staff — or from DELPHI — do an article on some phase of DELPHI each month, explaining what it is for, and then giving step-by-step (and I do mean step-by-step) instructions as to how to use that particular phase. After the preliminaries, you could start with fun things and then work up to the conferences and other more serious uses of DELPHI.

I've had a CoCo since 1982 (a CoCo 1 16K ECB, now a CoCo 3) and have subscribed to THE RAINBOW for almost all of that time and really enjoyed and use it a lot. I have taught myself some programming, write programs for my own use, and adapt others. I particularly enjoy typing in games from THE RAINBOW for use by the rest of my family. But I am not very up on electronics.

I think you have many readers who are not hackers but would enjoy using DELPHI if someone would tell them how.

Thelma J. Saffold
Austell, Georgia

KUDOS

Editor:

I wrote a letter to Larry Boeldt asking some questions about programming numerical variables. I included my home address and telephone number. A short time after mailing the letter, Larry called me at home one evening and offered me help. Our conversation lasted about five or ten minutes and Larry completely answered my questions and solved my programming problem. I tip my hat to Larry Boeldt!

All the folks who work on THE RAINBOW must be terrific because THE RAINBOW is terrific.

Roger I. Carlson
Tinley Park, Illinois

Quality Counts

Editor:

I have to comment on the fine quality of two products I recently bought: *Lyra* and *Simply Better*.

Lyra is fantastic. It plays eight-part music through my Casio MT-240 using up to three instrument sounds (other synthesizers can play more instrument sounds simultaneously) and requires no special interface other than a MIDI cable that Rulaford Research sends free with the program. And the ad doesn't mention that with *Lyra* comes *Lyraprint*, which allows you to print your creations with any amount of space between score lines if you desire to write in lyrics.

Simply Better is an excellent word processor. You can randomly select any of five fonts available on your printer, plus underlining. The fonts appear in colors you select, and underlining appears on-screen. It is command driven — a little harder to use at first, but once you learn the commands, you can really fly. I still haven't discovered everything *Simply Better* will do, but with the professional looking, easy-to-understand manual, I should have no problem.

Both these companies were polite and extremely helpful on the phone. I don't think anyone can be disappointed with their products and service.

Tony Whitaker
Norfolk, Virginia

Getting Your Money's Worth

Editor:

I would like to express my thanks to one of your contributors, Mr. Philip Brown, for his OS-9 article, "BASIC09 Programming Tool" (May '89, Page 138), on passing variables between simultaneously running programs. This one article is worth the price of all THE RAINBOW magazines I have ever bought.

I have always wondered whether there was a way to break the 64K barrier of OS-9 Level II by taking advantage of its multitasking abilities. Using his method, there is no reason programs of any size cannot be developed for the CoCo, limited only by the amount of memory in the machine, rather than the 64K, the 6809 can access directly.

Also, while he discussed the implementation in BASIC09, there is no reason the same technique could not be used in other languages, especially C or assembly.

Joseph A. Consugar
Annapolis, Maryland

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type `RAI` to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type `LET` to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.

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Fun at the 'Fest

I just returned from RAINBOWfest-Chicago, and though my legs are weary, my feet hurt, and I'm suffering from a lack of sleep, it was wonderful.

We had more exhibitors than last year, a huge number of CoCo Community members from as far away as Brazil, interesting seminars, and a lot of fun. But the best part of RAINBOWfest, was as always, the people. This year I took the flight home with the RAINBOW crew on Sunday night rather than going back Monday. As a result several of us got a chance to talk on the way to the airport and during the flight to Louisville. We talked mostly about the people at RAINBOWfest — there was such a variety. Everyone from mothers and infants to grandparents and in between, including guys who could anchor the offensive line for the Chicago Bears. All share an interest in the CoCo.

RAINBOWfesters, on one hand, are serious about the CoCo, but on the other, have so much fun. Three or four delegations of Canadians stopped by to talk and ask what they could do to change INTERTAN's mind about the CoCo in Canada, a subject which I wrote about several months ago. Then came smiles and laughter from those same people when they saw a particular piece of software run efficiently. A smaller but even brighter smile came from a little boy who won one of the three stuffed CoCo Cats (a new feature of the 'fest), which were given away at THE RAINBOW's Photo Button Booth.

It was great to see our new booth-holders so pleased that their programs and hardware setups were received with enthusiam by the crowd. We also enjoyed seeing how much our long-time RAINBOWfest exhibitors were refreshed as they spoke face-to-face with people whom they previously talked with only on the telephone.

En route back home, we decided that what makes RAINBOWfest so very special is the people who share a common interest in a most uncommon thing — our own Color Computer.

Technical editor Cray Augsburg mentioned that the CoCo is the longest-lived computer in the world today. I believe the reason for this is the CoCo Community.

When I worked for United Press International a long time ago, we were ruled by one simple stipulation: "Write this story for a milkman in Kansas City." That "Kansas City Milkman" became a hallmark of what UPI considered good writing — universal, understandable and clear. The Color Computer is the Kansas City milkman's computer, and that's why it's still around while lots of other computers are on the scrap heap.

What is more important, all of the "Kansas City Milkpeople" gather in Chicago in the Spring, and in New Jersey in the Fall to talk about their computers, learn a little more, and see what the latest software and hardware is all about. It renews and invigorates the spirit.

What was especially interesting about this recent show was that COMDEX, the spring meeting of the PC crowd, had been in Chicago the week before. There were some exciting developments, like the announcement of Intel's new 80486 chip, as well as the fact that a number of people attending COMDEX came to RAINBOWfest. One person commented, "I came to both events, but RAINBOWfest is where my heart is."

—Lonnie Falk

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UPS 2ND DAY AIR

How To Read Rainbow

When we use the term CoCo, we refer to an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

The BASIC program listings printed in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little disk and/or cassette symbols on the table of contents and at the beginning of articles indicate that the program is available through our RAINBOW ON DISK or RAINBOW ON TAPE service.

Using Machine Language

The easiest way to "put" a machine language program into memory is to use an editor/assembler, a program you can purchase from a number of sources. All you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of putting an ML listing into CoCo is called "hand assembly" — assembly by hand, which *sometimes* causes problems with `ORIGIN` or `EQUATE` statements. You ought to know something about assembly to try this.

Use the following program if you want to hand-assemble ML listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I, VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the `&H3F00` in Line 10 to `&H7F00` and change the value of `I` to `&H7F80`.

OS-9 and RAINBOW ON DISK

The OS-9 side of RAINBOW ON DISK contains two directories: `CMDS` and `SOURCE`. It also contains a file, `read.me.first`, which explains the division of the two directories. The `CMDS` directory contains executable programs and the `SOURCE` directory contains the ASCII source code for these programs. BASIC09 programs will only be offered in source form so they will only be found in the `SOURCE` directory.

OS-9 is a very powerful operating system. Because of this, it is not easy to learn at first. However, while we can give specific instructions for using the OS-9 programs, you will find that the OS-9 programs will be of little use unless you are familiar with the operating system. For this reason, if you haven't "learned" OS-9 or are not comfortable with it, we suggest you read *The Complete Rainbow Guide to OS-9* by Dale Puckett and Peter Dibble.

The following is not intended as a course in OS-9. It merely states how to get the OS-9 programs from RAINBOW ON DISK to your OS-9 system disk. Use the procedures appropriate for your system. Before doing so, however, boot the OS-9 operating system according to the documentation from Radio Shack.

1) Type `load dir list copy` and press ENTER.
2) If you have only one disk drive, remove the OS-9 system disk from Drive 0 and replace it with the OS-9 side of RAINBOW ON DISK. Then type `chd/d0` and press ENTER. If you have two disk drives, leave the sytem master in Drive 0 and put the RAINBOW ON DISK in Drive 1. Then type `chd/d1` and press ENTER.
3) List the `read.me.first` file to the screen by typing `list read.me.first` and pressing ENTER.
4) Entering `dir` will give you a directory of the OS-9 side of RAINBOW ON DISK. To see what programs are in the `CMDS` directory, enter `dir cmds`. Follow a similar method to see what source files are in the `SOURCE` directory.
5) When you find a program you want to use, copy it to the `CMDS` directory on your system disk with one of the following commands:

One-drive system: `copy /d0/cmds/` *filename* `/d0/cmds/`*filename* `-s`

The system will prompt you to alternately place the source disk (RAINBOW ON DISK) or the destination disk (system disk) in Drive 0.

Two-drive system: `copy /d1/cmds/` *filename* `/d0/cmds/` *filename*

Once you have copied the program, you execute it from your system master by placing that disk in Drive 0 and entering the name of the file.

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Rainbow Check Plus

The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS*, type in the program and save it for later use, then type in the command `RUN` and press ENTER. Once the program has run, type `NEW` and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

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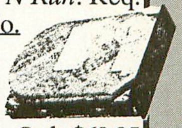

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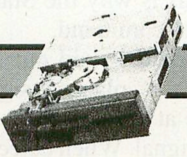

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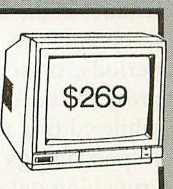

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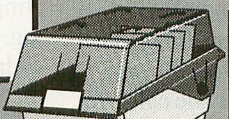

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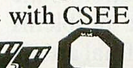

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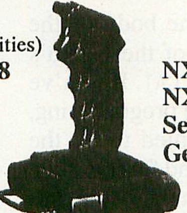

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UPS 2ND DAY AIR

Repeating characters at the push of a button

Auto Repeat

Part I of II

by William F. Medlock

Everyone who has used one of those more powerful, but more expensive, machines misses some of its features in the CoCo. For instance, wouldn't it be nice to produce a whole line of periods, or some other character, at one press of the key? It would be convenient while editing a line of BASIC. Or wouldn't it speed things up if, while the computer is crunching data, you can enter more data, even though the computer is not ready to process it?

While on the subject of "what ifs", concerning Microsoft's `ON BREAK` business, if it was `ON BREAK GOSUB` rather than `ON BREAK GOTO`, you could really lock out the BREAK key. The author programmed on a Dartmouth BASIC machine, which allows either choice. If you miss the BREAK key, you're still not home free; there is a menu on the screen and you must push CLEAR. If the programmer doesn't anticipate this in the program, he or she can't get the menu back.

This article provides the solution to the auto repeat, BREAK and CLEAR problems for all CoCos. The second and final article of theseries will present *Key Ahead*, a program to work with the CoCo 3.

This month's item is a program called *Repeat* that provides auto repeat, BREAK key lockout and CLEAR key lockout. *Repeat* can be loaded to any empty area of memory, such as the first page of graphics that cannot be `PCLEAR`ed, or, if you have a CoCo 1 or 2, the memory above the disk ROM starting at $E00. After starting, it installs itself in the operating system and you can go about your business. It works with all BASIC or machine language programs.

William Medlock is a self-taught computer user who has worked at everything from fixing TVs to designing telemetry systems and hardware. He is currently involved in hardware, firmware and software development of LAN interfaces.

Program Listing

As already mentioned, *Repeat* loads to any address. It is written with relative addressing and a load address must be specified when loading. An `ORG` statement can be added to the beginning to create a load address in the file, but this is left to the reader's discretion.

Repeat is divided into two sections, the first of which is the Start-Up routine. Beginning at Line 200, it tests which operating-system version is installed by checking the second byte of the `POLCAT` jump address. If the computer is a CoCo 2 or 3, the Start-Up routine modifies itself and the program body. Line 230 loads the two values used in the modification. Line 240 modifies Line 260 and Line 250 modifies Line 870. Line 260 loads the address in the Keyboard routine of the operating system in which a `JUMP` command is inserted by lines 270 through 300.

The second section is the body of the program, including a part of the CoCo's operating system called `POLCAT`. If you've done any assembly language programming, you have used it; it is pointed to by the value in locations $A000 and $A001. The purpose of `POLCAT` is to scan the keyboard, determine which key is being pushed, and return the ASCII value of the key.

The purpose of *Repeat* is to enhance `POLCAT`, not replace it. The enhancement cannot fit into the operating system, so control of `POLCAT` must jump out and back in again. This is why the Startup-routine inserts a `JUMP` command.

The keyboard is laid out in rows and columns. `POLCAT` places a signal on each column, one at a time, while it tests each row for the signal. When detected, the row and column are converted into the ASCII code of the character. At the low end of memory is stored a matrix corresponding to the rows and columns of the keyboard. The matrix contains the row and column of the first key pushed; the bit is the row and address in the column.

When control arrives at *Repeat*, Register A contains a value in which all the bits are high, except for the one corresponding to the row containing the pushed key, if in the current column. This value is also pushed to the top of the stack by `POLCAT`. Register X contains the address in the matrix corresponding to the current column of the keyboard. If the value in A is $FF, no key has been pushed.

When the `JUMP` instruction is inserted into `POLCAT` it destroys two commands. The result is that the value in A on returning to `POLCAT` must be the compliment of what it was on entering *Repeat*; Line 370 does this for a no-key situation. In some versions of the operating system, the carry bit in the Condition Code register must be set. Line 380 does this.

When a key is pressed, *Repeat* tests for the BREAK key row and column (lines 410 through 440). If they both are true, control jumps to `NOKEY` and back to `POLCAT`. If either is false, *Repeat* then tests for the CLEAR key row and column. If either is false, control jumps to `GOODKY` (lines 460 through 490).

When the CLEAR key is pressed, the SHIFT key must be tested because SHIFT-CLEAR produces a back slash (\). This is

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done by changing the signals to the keyboard, sending different data to the PIA or peripheral interface adapter connecting the computer to the keyboard, and testing the signals from the keyboard.

The test for the SHIFT sequence in lines 510 through 600 follows. Push the current key code to the stack and temporarily hold the value, placed in the PIA by `POLCAT`, in A. Then load the new value for the PIA into B and place the new value into the PIA. Load the new keyboard output signal into B and place the `POLCAT` value back into the PIA. Next, test the keyboard output signal for the SHIFT key and pull the current key code off the stack back into A (this does not change the CC register). Branch to `GOODKY` if SHIFT has been pressed. Branch to `NOKEY` if SHIFT has not been pressed.

Lines 620 and 630 are the `POLCAT` commands destroyed when *Repeat* installs itself into the operating system. Their function is to compare a pressed key with the previous pressed key. If the keys are the same, A contains a zero; otherwise the appropriate bit in A is set and all others are cleared. The original purpose was to prevent an uncontrolled repeat of the pressed key. The new purpose is to either clear `COUNT2` and return a key code immediately, or jump to `SAMEKY`, which controls the initial delay counter.

`COUNT2` contains the current count of the delay counter, which determines how long to wait for the repeat to start. There are two different counter limits, one used with machine language programs, such as *EDTASM*, *Scripsit* and *Pyramid*, the other used with BASIC. For a machine language program, use Line 720; for BASIC, use Line 730.

When `COUNT2` reaches its limit, control jumps to `RPTKEY`. If not, `COUNT2` is incremented and control jumps to `NOKEY`.

At `RPTKEY`, the uncomplimented key code is restored to A without changing the value of the stack pointer. `COUNT` contains the current value of the delay counter determining the repeat speed. `COUNT` is tested to see if it has reached zero; if it has, control jumps `RETKEY`. If not, it is decremented and control jumps to `NOKEY`.

At `RETKEY`, `COUNT` is restored to its initial value. Here, again, there are two different values, one for machine language programs and one for BASIC. For a machine language program, use Line 830; for BASIC use Line 840. The key code in A is complemented and control is returned to `POLCAT`.

All of the storage locations used by *Repeat* are referred to with program-counter relative addressing, all of the jumps within the program are with `BRANCH` commands, and all of the jumps back to `POLCAT` are with `JMP` commands. These three rules make it possible for *Repeat* to load to any address in which the operator wants it to reside.

The means used to return control to `POLCAT` deserves attention. There are three locations in *Repeat* that pass control back to `POLCAT`; the return location is different for various versions of the operating system. How does the Start-Up routine set the return address in all three places with some efficiency? The answer is with indirect addressing.

Indirect addressing means the address desired is in a memory location. An address contained in another address is called a vector or pointer. There are different forms of indirect addressing, but the one used in *Repeat* is called PC Relative Indirect. The `JMP (RETRN,PCR)` states that the return address is in `RETRN` and `RETRN` is located by adding a constant to the program counter. Therefore the Start-Up routine only has to change one location instead of all three.

If a BREAK key lockout is not desired, Line 420 should be changed to `BRA`. If a CLEAR key lockout is not desired, Line 470

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should be changed to `BRA`.

Assembling the Program

Listing 1, `REPEAT`, is entered using a disk assembler such as Color Disk *EDTASM*, or the cartridge *EDTASM*. If a disk assembler is used, `REPEAT` can be assembled to disk without a start address. It can then be loaded into any part of memory and started using: `LOADM "REPEAT",`*address*`:EXEC`.

The same procedure can be used if the cartridge *EDTASM* and a tape system are used, with `CLOADM` instead of `LOADM`. If you have a disk system, but only have the cartridge *EDTASM*, first decide what address will be used for the start of the program. Then assemble to tape or memory, and save to tape. Re-insert the disk controller, load `REPEAT` from tape, and resave to disk using `SAVEM`.

The BASIC Program

If you are not already familiar with this procedure, do not have an assembler, or do not feel confident with either of these procedures, use the BASIC program included in Listing 2.

The BASIC version requires a minimum of effort; the loading address is fixed. The options offered in the assembly language version are here in the form of prompts. If needed, the prompts can be replaced with constants for specific applications. The options cannot be in the assembly language versions as prompts because of the increased complexity of the program.

Note that the line numbers are not consecutive multiples of ten, as is customary. The second article in this series will feature a BASIC program called *Key Ahead* . Both programs are written so either can run alone or merge into one that does the functions of both. If you have a CoCo 3 and plan on using *Key Ahead* from next month's issue, key in the program exactly as listed, even though certain lines are not executed. Do not renumber the lines. If you have a CoCo 1 or 2, lines 140 through 170 can be omitted and the program renumbered.

As with any BASIC program that pokes a machine language program into memory, prevent yourself a lot of grief by always saving the program before trying it. As a matter of fact, I even go so far as to open the door of the disk drive when trying an unproven machine language program.

Applications and Caveats

If you have a CoCo 1 or 2, remember to change to the 64K mode the very first thing after turning on the computer. If using the machine language version, load the program to $E000. *Repeat* works wonderfully at this address since there is

Listing 1:

```
                     00090           TITLE   REPEAT.ASM
                     00100 ***************************
                     00110 * BREAK & CLEAR KEY       *
                     00120 *LOCKOUT AND AUTOREPEAT *
                     00130 * MAY BE LOADED TO ANY  *
                     00140 * LOCATION.              *
                     00150 ***************************
                     00160
                     00170 ***************************
                     00180 * START-UP ROUTINE       *
                     00190 ***************************
0000 B6   A001       00200 BEGIN   LDA     $A001
0003 81   CB         00210         CMPA    #$CB    NEW OS
0005 26   0B         00220         BNE     OLD
0007 CC   E3E7       00230         LDD     #$E3E7  MODIFY PROGRAM FOR COCO2 OS
000A A7   8D 0006    00240         STA     OLD+2,PCR
000E E7   8D 0084    00250         STB     RETRN+1,PCR
0012 8E   A1E0       00260 OLD     LDX     #$A1E0  INSERT JUMP IN OS FOR RPT
0015 86   7E         00270         LDA     #$7E
0017 A7   80         00280         STA     ,X+
0019 31   8D 0004    00290         LEAY    START,PCR
001D 10AF 84         00300         STY     ,X
0020 39              00310         RTS
                     00320 ***************************
                     00330 * PROGRAM BODY           *
                     00340 ***************************
0021 81   FF         00350 START   CMPA    #$FF
0023 26   06         00360         BNE     TSTBRK  IF KEY IN PRESENT COL PUSHED
0025 4F              00370 NOKEY   CLRA            MAKE A SHOW NO KEY
0026 53              00380         COMB            SET CARRY
0027 6E   9D 006A    00390         JMP     [RETRN,PCR] * BACK TO OP SYS
                     00400 **** TEST BREAK KEY
002B 8C   0154       00410 TSTBRK  CMPX    #$154   BREAK KEY COL
002E 26   04         00420         BNE     TSTCLR
0030 81   BF         00430         CMPA    #$BF    BREAK KEY ROW
0032 27   F1         00440         BEQ     NOKEY   "NO KEY" EXIT
                     00450 **** TEST CLEAR KEY
0034 8C   0153       00460 TSTCLR  CMPX    #$153   CLEAR KEY COL
0037 26   1C         00470         BNE     GOODKY  ALL OTHER COLUMNS
0039 81   BF         00480         CMPA    #$BF    CLEAR KEY ROW
003B 26   18         00490         BNE     GOODKY  NOT CLEAR KEY
                     00500 **** IS CLEAR KEY SHIFTED?
003D 34   02         00510         PSHS    A       SAVE KEY NUMBER
003F B6   FF02       00520         LDA     $FF02   KEY BOARD INPUT
0042 C6   7F         00530         LDB     #$7F
0044 F7   FF02       00540         STB     $FF02   SET SHIFT COL LOW
0047 F6   FF00       00550         LDB     $FF00   KEY BOARD OUTPUT
004A B7   FF02       00560         STA     $FF02   RESTORE KEYBOARD INPUT
004D C4   40         00570         ANDB    #$40    TEST SHIFT ROW
004F 35   02         00580         PULS    A       RESTORE KEY NUMBER
0051 27   02         00590         BEQ     GOODKY  SHIFTED
0053 20   D0         00600         BRA     NOKEY   NOT SHIFTED
                     00610 ***************************
0055 A8   84         00620 GOODKY  EORA    ,X      * SAME KEY OR DIFFERENT KEY
0057 A4   84         00630         ANDA    ,X      *
                     00640 ***************************
0059 27   0E         00650         BEQ     SAMEKY  SAME KEY
005B CC   0000       00660         LDD     #0000
005E ED   8D 0036    00670         STD     COUNT2,PCR      CLEAR DELAY COUNT
0062 A6   61         00680         LDA     1,S     RESTORE A
0064 43              00690         COMA
0065 6E   9D 002C    00700         JMP     [RETRN,PCR]
0069 EC   8D 002B    00710 SAMEKY  LDD     COUNT2,PCR
006D 1083 0300       00720         CMPD    #$300   DELAY COUNT, THIS LINE WITH ML
                     00730 *       CMPD    #$60    USE THIS LINE WITH BASIC
0071 27   09         00740         BEQ     RPTKEY  IF DELAY COMPLETE
0073 C3   0001       00750         ADDD    #1
0076 ED   8D 001E    00760         STD     COUNT2,PCR      INCREMENT DELAY COUNT
007A 20   A9         00770         BRA     NOKEY
007C A6   61         00780 RPTKEY  LDA     1,S     RESTORE A
007E 6D   8D 0015    00790         TST     COUNT,PCR       REPEAT SPEED
0082 27   06         00800         BEQ     RETKEY  SEND CHARACTER
0084 6A   8D 000F    00810         DEC     COUNT,PCR       DELAY COUNT
0088 20   9B         00820         BRA     NOKEY
008A C6   80         00830 RETKEY  LDB     #$80    REPEAT SPEED PRESET, WITH ML
                     00840 *RETKEY LDB     #$08    USE THIS LINE WITH BASIC
008C E7   8D 0007    00850         STB     COUNT,PCR       RESET REPEAT SPEED
0090 43              00860         COMA
0091 6E   9D 0000    00870         JMP     [RETRN,PCR]
0095      A1E4       00880 RETRN   FDB     $A1E4   RE-ENTRY ADDR
0097                 00890 COUNT   RMB     1
0098                 00900 COUNT2  RMB     2
          0000       00910         END

00000 TOTAL ERRORS
```

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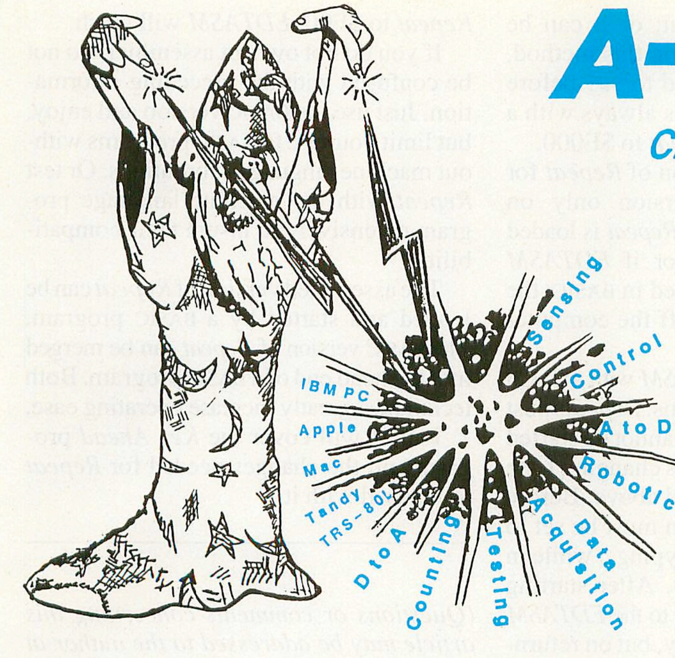

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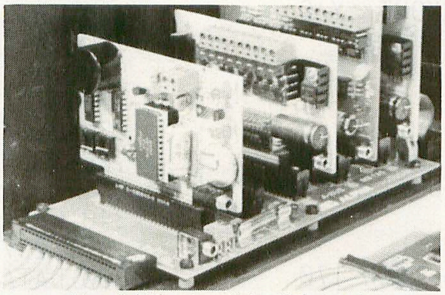

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no problem with memory contention. As far as I know, *Repeat* runs with everything, machine language or BASIC, when loaded to this address.

The CoCo 3 presents some problems. For a BASIC program without low-resolution graphics, load *Repeat* to address $E00 for a disk system (assuming that you have not used the `FILES` command), or address $600 for a tape system. If the applications program uses low-resolutions graphics, you can always `PCLEAR` an extra page for the program.

If the applications program is machine language, you need to experiment, by trial and error, to find out where the program starts and ends, and what addresses it uses for data. Load the program to a different address and see if everything works. Some suggestions are to load address $E00 first. If this does not work, try loading it to $7F00.

Using *EDTASM* with a CoCo 1 or 2 can be done two ways: *Repeat* can be started before running DOS, in which case there is nothing to worry about; or it can be loaded using *ZBug*. If using this method, Line 310 must be changed to `SWI` before assembling. Remember, as always with a CoCo 1 or 2, to load *Repeat* to $E000.

When creating a version of *Repeat* for *EDTASM*, keep this version only on *EDTASM* disks. If regular *Repeat* is loaded and started with *ZBug*, or if *EDTASM Repeat* is loaded and started in BASIC, the system will hang. Turn off the computer and start over again.

Using *Repeat* and *EDTASM* with a CoCo 3 requires some precautions. *Repeat* must be loaded with *ZBug* and cannot be started while in BASIC. This means changing Line 310 to `SWI` as is mentioned above. Before loading, the manual origin must be set to $7F00, which is done by typing `O` while in `EDITOR`, then typing `7F00`. After starting *Repeat*, you can drop down to the *EDTASM* DOS to check the directory, but on returning to the editor, always reset the manual origin before proceeding. Since *EDTASM* uses all available memory, do not load *Repeat* to $E00; *EDTASM* will crash.

If you do not own an assembler, do not be confused with the preceding information. Just use the BASIC version and enjoy, but limit your use to BASIC programs without machine language subroutines. Or test *Repeat* with the machine language program extensively to insure their compatibility.

The assembled version of *Repeat* can be loaded and started by a BASIC program. The BASIC version of *Repeat* can be merged into the head end of a BASIC program. Both techniques greatly increase operating ease.

Part II will cover the *Key Ahead* program and the changes needed for *Repeat* to be used with it.

(Questions or comments concerning this article may be addressed to the author at 2429F Wesvill CT, Raleigh, NC 27607. Please include an SASE when requesting a reply.) ❑

Listing 2: REPEAT

```
0 ‘ COPYRIGHT 1989  FALSOFT,INC
10 CLEAR 200,32511:REM ADD-1
20 PRINT”REPEAT KEY”:OF=0
40 ADD=32512:EX=ADD
50 INPUT”SPEED FAST OR SLOW (F O
R S)”;SP$
60 IF SP$<>”F” AND SP$<>”S” THEN
 50
70 INPUT”BREAK KEY LOCKOUT (Y OR
 N)”;BR$
80 IF BR$<>”Y” AND BR$<>”N” THEN
 70
90 INPUT “CLEAR KEY LOCKOUT (Y O
R N)”;CL$
100 IF CL$<>”Y” AND CL$<>”N” THE
N 90
110 READ BYTE
120 IF BYTE = 256 THEN 180
130 POKE ADD,BYTE:ADD=ADD+1:GOTO
110
140 REM
150 READ ADD:IF ADD=256 THEN 170
 ELSE READ V1,V2
160 POKE ADD+EX,V1:POKE ADD+EX+1
,V2:GOTO 150
170 POKE EX+186,0:POKE EX+187,21
:POKE EX+214,4
180 IF SP$=”S” THEN POKE EX+111,
3:POKE EX+112,0: POKE EX+139,128
190 IF BR$=”N” THEN POKE EX+OF+4
6,32
200 IF CL$=”N” THEN POKE EX+OF+5
5,32
210 EXEC EX:END
220 DATA 182,160,1,129,203,38,11
,204,227,231,167,141,0,6,231,141
,00,132
230 DATA 142,161,224,134,126,167
,128,49,141,0,4,16,175,132
290 DATA 57
300 DATA 129,255,38,6,79,83,110,
157,0,106,140,1,84,38,4,129,191,
39,241,140,1
310 DATA 83,38,28,129,191,38,24,
52,2,182,255,2,198,127,247,255,2
,246
320 DATA 255,0,183,255,2,196,64,
53,2,39,2,32,208,168,132,164,132
,39
330 DATA 14,204,0,0,237,141,0,54
,166,97,67,110,157,0,44,236,141,
0
340 DATA 43,16,131,0,96,39,9,195
,0,1,237,141,0,30,32,169,166,97
350 DATA 109,141,0,21,39,6,106,1
41,0,15,32,155,198,8,231,141,0,7
360 DATA 67,110,157,0,0,161,228,
0,0,0
370 DATA 256
420 DATA 16,0,207,27,0,79,39,1,1
3,43,0,184,51,1,9,55,1,1,59,0,25
5
430 DATA 63,1,253,67,1,249,71,0,
204,100,0,210,256
```

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Authors Dale Puckett and Peter Dibble show how to take advantage of OS-9's multitasking and multiuser features. An easy-to-read, step-by-step guide packed with hints, tips, tutorials and free software in the form of program listings.
Book $19.95, Disk Package $31 (2 disks, book not included)

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VIP Writer III Ver. 2 ✻Cat. #90-908

VIP Writer III offers screen widths of 32, 40, 64 & 80 - all with 24 lines and actual lower case letters using the CoCo 3's hardware display. It runs at double clock speed and has 4-color menus making VIP Writer III FAST and EASY to use! You can choose foreground, background, hilite and cursor colors from up to 64 hues. Color can be turned ON or OFF for the best possible display using a monochrome monitor or TV set. VIP Writer III has a context sensitive help facility to display command usage in easy to read colored windows.

CUSTOMIZER & PRINTER INSTALLER

VIP Writer III comes with a configuration / printer installation program which lets you customize VIP Writer III to suit your own liking. You can set screen width and colors as well as margins and more. You can also install your own printer and set interface type (serial, parallel or J&M), baud rate, line feeds, etc. Once done, you never have to enter these parameters again! VIP Writer III will load n' go with your custom configuration every time!

MORE TOTAL TEXT STORAGE

VIP Writer III has 106K total text storage in a 128K CoCo 3 (495K in 512K). VIP Writer III creates ASCII text files which are compatible with all other VIP Programs as well as other programs which use ASCII files. You can use VIP Writer III to even type BASIC programs! There is a 48K text buffer (438K in a 512K CoCo 3) and disk file linking allowing virtually unlimited text space. VIP Writer III works with up to four disk drives and lets you display directories and free space as well as rename or kill disk files. In addition VIP Writer III is 100% compatible with the RGB Computer Systems Hard Disk.

POWERFUL EDITING FEATURES

VIP Writer III has a full featured screen editor which can be used to edit text with lines up to 240 characters long with or without automatic word wrap around. You can select type-over mode or insert mode. There is even an OOPS command to recall a cleared text buffer. Other editing features include: Type-ahead • typamatic key repeat and key beep for flawless text entry • end of line bell • full four way cursor control with scrolling • top of textfile • bottom of textfile • page up • page down • top of screen • bottom of screen • beginning of line • end of line • left one word • right one word • DELETE character, to beginning or end of line, word to the left or right, or entire line • INSERT character or line • LOCATE and/or CHANGE or DELETE single or multiple occurrence using wildcards • BLOCK copy, move or delete with up to TEN simultaneous block manipulations • TAB key and programmable tab stops • word count • line restore • three PROGRAMMABLE FUNCTIONS to perform tasks such as auto column creation and multiple copy printing.

Writer III or Library /W owners: Upgrade to the VIP Writer III 2.0 for $10 + $3 S/H. Send ORIGINAL disk and $13 total.

Rated "BEST" in RAINBOW Sept. 1988

AUTOMATIC TEXT FORMATTING

VIP Writer III automatically formats your text for you or allows you to format your text in any way you wish. You can change the top, bottom, left or right margin and page length. You can set your text flush left, center or flush right. You can turn right hand justification on or off. You can have headers, footers, page numbers and TWO auxiliary lines which can appear on odd, even or all pages. You can also select the line on which they appear! You can even change the line spacing! Parameters can be altered ANYWHERE !

PREVIEW PRINT FORMAT WINDOW

VIP Writer III features an exclusive format window which allows you to preview your document BEFORE PRINTING IT! You are able to move up, down, left and right to see centered and justified text, margins, page breaks, broken paragraphs, orphan lines etc.

PRINTING VERSATILITY

VIP Writer III prints TWICE as fast as any other CoCo word processor! It supports most serial or parallel printers using J&M JFD-CP or Rainbow interface and gives you the ability to select baud rates from 110 to 19,200. You can imbed printer control codes anywhere in your text file EVEN WITHIN JUSTIFIED TEXT! VIP Writer III also has TWENTY programmable printer macros which allow you to easily control all of your printers capabilities such as bold, underline, italics and superscript using simple key strokes. Other features include: multiple copy printing • single sheet pause • line feeds.

BUILT IN PRINT SPOOLING

VIP Writer III has a print spooler with a 57,000 character buffer which allows you to print one document WHILE you are editing another. You don't have to wait until your printer is done before starting another job! Some word processors DO NOT include this feature!

50,000 WORD SPELLING CHECKER

VIP Writer III includes VIP Speller (not FREEWARE) to check your text for misspelled words It has a 50,000 (not 20,000) word dictionary that can be added to or edited.

QUALITY DOCUMENTATION

VIP Writer III comes with a well written 125 page manual which is Laser printed, not dot-matrix like the competition. It includes a tutorial, glossary of terms and examples for the beginner as well as a complete index! VIP Writer III is truly the BEST you can buy.

VIP Writer III includes VIP Speller 1.1. **DISK $79.95**

VIP Writer owners: Upgrade to the Writer III 2.0 for $49.95 + $3 S/H. Send original disk and $52.95 total.

VIP Database III ✻Cat. #90-915

VIP Database III features selectable screen displays of 40, 64 or 80 characters by 24 lines with choice of 64 foreground, background, hilite and cursor colors for EASY DATA ENTRY. It uses the CoCo 3's hardware screen and double clock speed to be the FASTEST database available! VIP Database III will handle as many records as will fit on your disks and is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. IN-MEMORY SORT of records is LIGHTNING FAST and provides for easy listing of names, figures, addresses, etc., in ascending or descending alphabetical or numeric order. Records can be searched for specific entries using multiple search criteria. The built-in mail-merge lets you sort and print mailing lists, print form letters, address envelopes - the list is endless. The built-in MATH PACKAGE even performs arithmetic operations and updates other fields. VIP Database III also has a print spooler and report generator which uses print forms you create. **DISK $69.95**

VIP Database owners: Upgrade to the VIP Database III for $39.95 + $3 S/H. Send ORIGINAL disk and $42.95 total.

VIP Library /WDCE $179.95

The VIP Library /WDCE (Writer Database Calc Enhanced) combines all six popular VIP application programs - VIP Writer III, Database III, Calc III, Speller, Terminal and Disk-ZAP - into one program on one disk called VIP Desktop. For VIP Library shipping please add $4 USA. $5 Canada. $10 Foreign.

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VIP Library /WDE owners: Upgrade to the VIP Library /WDCE for $10 + $3 S/H. Send ORIGINAL disk and $13 total.

SD Enterprises info line (805) 566-1317
P O Box 621 Carpinteria, Ca. 93013

Non VIP Library orders add $3 for shipping and handling in USA. Canada $4. Foreign $6. COD orders add an additional $2.75. Checks allow 3 weeks for delivery. California residents add 6% sales tax.

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Now every CoCo 3 owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some. VIP Calc III allows a large worksheet with up to 512 columns by 1024 rows! In addition, VIP Calc III has up to 16 windows which allow you to compare and contrast results of changes. Other features include 8 AND 16 digit precision • trig. functions • averaging • algebraic functions • column and row ascending and descending SORTS • locate formulas or titles in cells • block move and replicate • global or local column width • limitless programmable functions • create BAR charts. Embed printer control codes for customized printing. Combine spreadsheet data with VIP Writer documents to create ledgers, projections, statistical & financial budgets and reports. **DISK $69.95**

VIP Calc owners: Upgrade to the VIP Calc III for $29.95 + $3 S/H. Send original disk and $32.95 total.

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The Heat Is On

Turn up the heat with the games of summer — the newest and the hottest for your Color Computer

A motley crew: In the foreground, Tandy's Color Mouse and the Wico Trackball from Zebra Systems; in the back, the CH Flight-Stick and Questron's joystick.

A HANDLE ON THE SITUATION

The Questron Joystick ($29.95) has it all: a base with suction cups for secure one-handed operation; two firebuttons — one top-mount and one trigger-mount; a pistol grip for comfort and precision; audible clicks for movement and firing; and an Auto-fire switch. This is a joystick designed for split-second decisions in fast-action arcade games. The Auto-fire button sends out a steady stream of bullets or laser bolts, etc., letting you devote your full attention to the business of "driving." This is definitely one of the most comfortable joysticks around.

(Questron, P.O. Box 1013, Rochester, IN 46975, 219-223-5584)

THE REIGN OF THE RODENT

The joystick, whether it deserves it or not, has garnered itself the reputation of being the "adolescent interface." Even though it is not limited for use with game software. Try maintaining dignity when demonstrating serious programs like *Max-10* to MS-DOS snobs — with a joystick. Bombs away! Plug in a two-button Tandy Color Mouse ($49.95) instead. (And after your misled MS-DOS acquaintances leave, you can try mousing around in games that call for a paddle ball-type control.)

(Tandy Corporation, 1700 One Tandy Center, Fort Worth, TX 76102)

IN THE PALM OF YOUR HAND

If it's an arcade trackball you've been wanting, the Wico Command Control ($49.95) just may be what you're looking for. Test the freedom of full 360-degree movement. Determine how fast you want to zoom across the screen by how fast you rev your hand over the surface. Your brain will think that your hands have wandered off to the local arcade hangout.

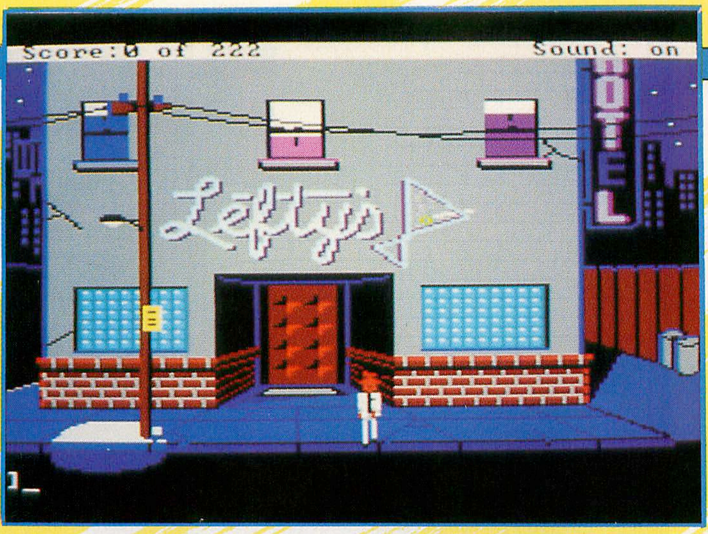
(Zebra Systems, Inc., 78-06 Jamaica Ave., Woodhaven, NY 11421, 718-296-2385)

THE SKY'S THE LIMIT

Takeoffs are never a problem with the self-centering Flight-Stick ($74.95), a solid, top-of-the-line joystick that's designed and marketed *for the Tandy 1000*. (You *did* know that Tandy 1000 and Color Computer joysticks are interchangeable, didn't you? CoCo kudos go to Gregory Snow for bringing the Flight-Stick to our attention.)

The FlightStick for the 1000 features a pistol grip with both top and trigger-finger buttons. The joystick, designed with flight simulators in mind, floats on two rotational axes and gives the user a sense of enhanced precision. About the largest joystick we've ever seen, it's base is heavy and broad enough so that it can sit on a desktop without danger of tipping or slipping — no handholding required.

(CH Products, 1225 Stone Drive, San Marcos, CA 92069, 619-744-8546)



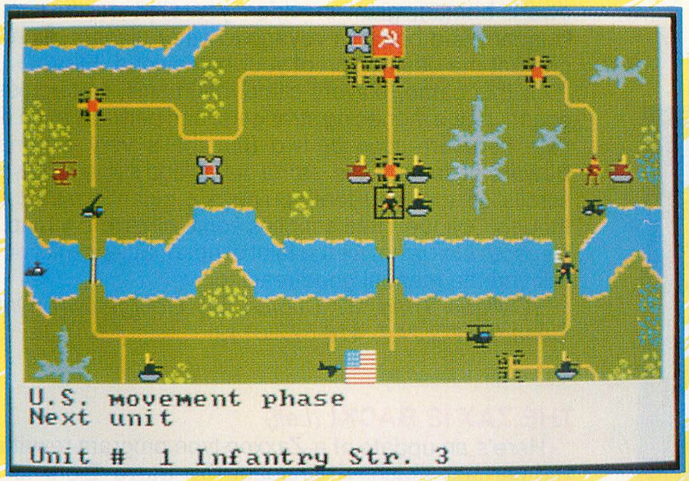
```
Score:0 of 222                    Sound: on
```

MAKE LOVE, NOT WAR

Are you above the age of consent? If not, turn back now, skip over to the next product mention — *you shouldn't be reading this!* Now, we can talk about *Leisure Suit Larry in the Land of the Lounge Lizards* ($39.95), a 3-D animated adventure game of the adult variety.

See, there's this guy Larry, and he's just turned 40, and he's never . . . I mean, his only goal in life is to lose his . . . Well, suffice it to say that the game is a tongue-in-cheek, risque romp through an evening you'll never forget as you help Larry run the mile for manhood. *Leisure Suit Larry* requires a 512K CoCo 3 and a disk drive.

(Sierra On-Line, Inc., P.O. Box 485, Coarsegold, CA 93614, 209-683-4468)



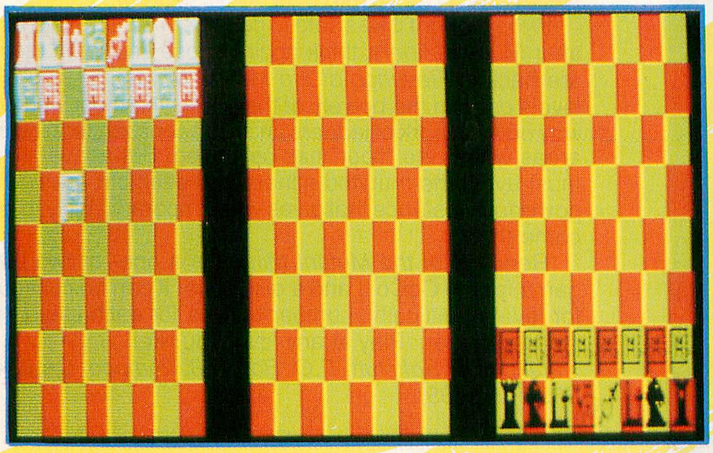
```
U.S. movement phase
Next unit

Unit #  1 Infantry Str. 3
```

MAKE WAR, NOT LOVE

For the do-it-yourself warmonger: Design and play your own conflict simulations. *Wargame Designer II* ($25) for the CoCo 3 comes with one ready-to-go scenario and four extra icon sets. Use a joystick to custom-create terrain down to a tree. Determine your unit's strength, firing range and level of aggression. Think strategy, plan your moves; the computer takes care of "paperwork." You couldn't "stand" Custer's defeat? Do it yourself. Think Waterloo was a rather soggy end to a humble emperor's career? Become Napoleon and try, try again.

(SPORTSware, 1251 S. Reynolds Road, Suite 414, Toledo, OH 43615, 419-389-1515)



CHESS IN THE 4TH DIMENSION

Yes, the fourth dimension, that of time. *4-D Chess* ($24.95) is two-player 3-D chess with a little something extra — a time element. Players can actually *teleport* or *time out* a piece for a designated period (the teleporting move must be a legal one at the time of initiation). Lots of havoc can be wreaked by one well-planned rematerialization!

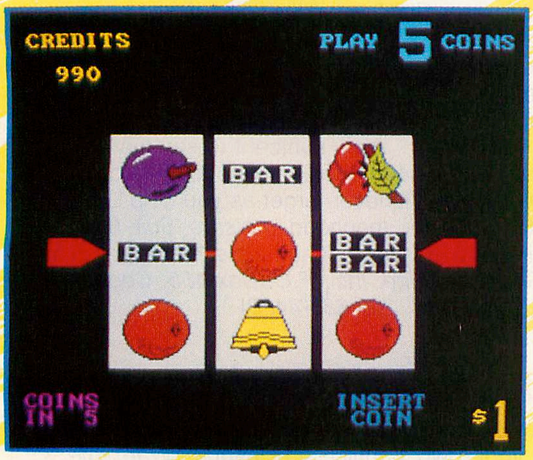
If 4-D is too exotic, there is also a two-player, 2-D (standard) mode. No matter what dimension played, *4-D Chess* requires a CoCo 3, a disk drive and a chess partner.

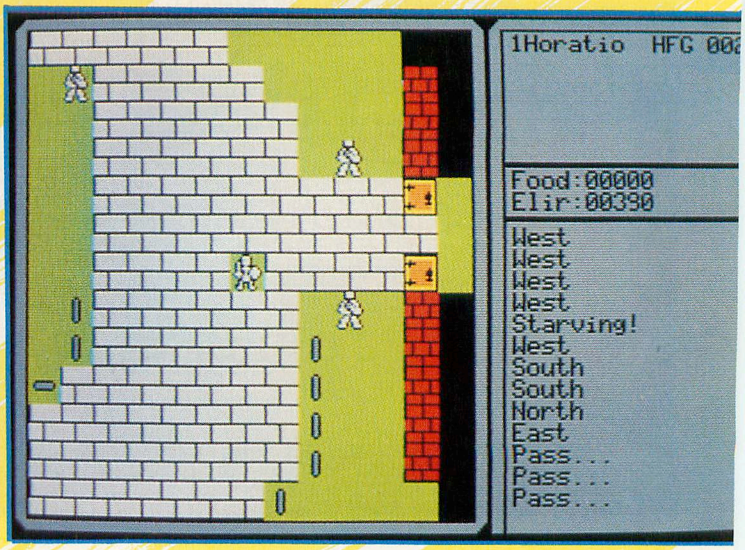
(Microcom Software, 2900 Monroe Ave., Rochester, NY 14618, 800-654-5244)

CASHING IN YOUR CHIPS *(Below)*

If you like to take risks but won't venture past a safe bet, *Slots & Cards* ($39.95) is for you! It doesn't matter how much you blow at slot machines, poker or keno tables, your wallet will never feel a thing. What's your game — slots, video poker, blackjack, keno, high/low? They're all here, accompanied by brilliant graphics for CoCos 1, 2 and 3.

(MichTron, 576 S. Telegraph, Pontiac, MI 48053, 313-334-5700)





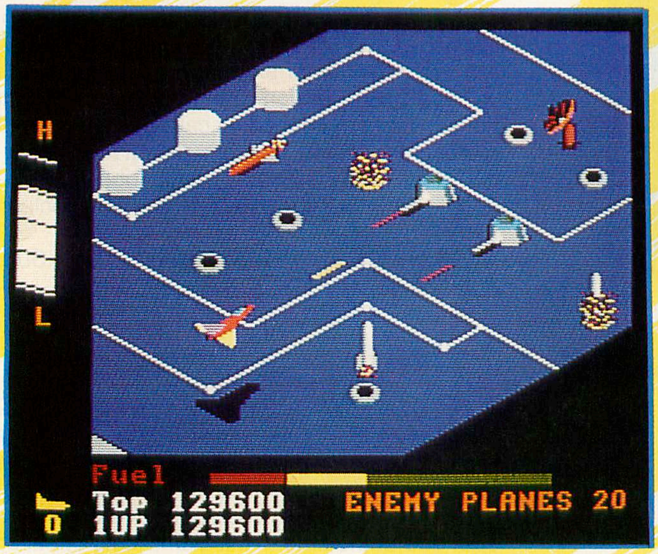
```
1Horatio  HFG 00
Food:00000
Elir:00390
West
West
West
West
Starving!
West
South
South
North
East
Pass...
Pass...
Pass...
```

THE PLANET SAVERS *(Above)*

Rumor has it that it takes at least 200 hours (but only if you're good) to solve *The Seventh Link* ($38 US, $48 CDN), an exciting graphics adventure for the CoCo 3. Be you dwarf, human, giant or elder, you start out in one little kingdom and perhaps voyage to other planets in order to prevent the destruction of your homeworld, Elira.

In this game, players climb mountains, sail across the ocean, battle menacing strangers, and perhaps even negotiate a resurrection or two (but that's very expensive). Beware of sea snakes, stone giants and slime! The screen scrolls so that you feel you're in a gigantic maze. Even though Oblique Triad supplies some hints and a map, *The Seventh Link* is not for the faint of heart. Science fiction fans will find the manual good reading.

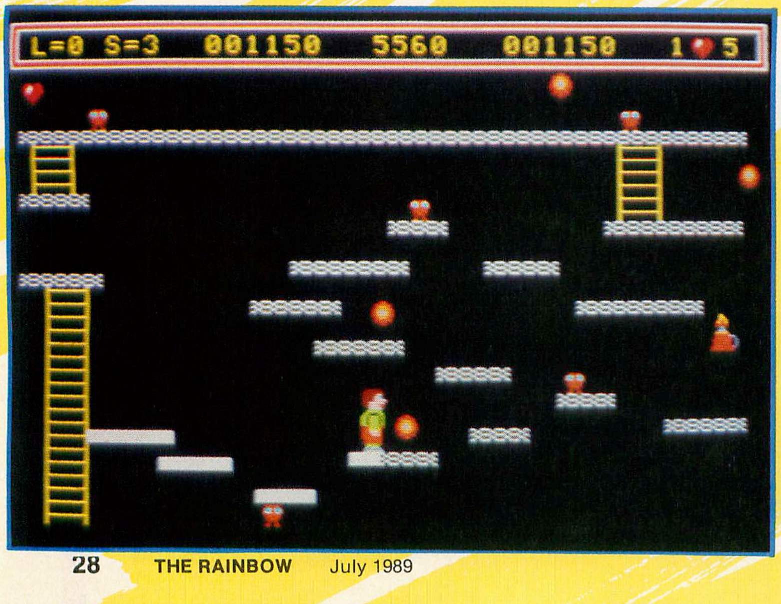
(Oblique Triad, 32 Church St., Georgetown, Ontario, Canada L7G 2A7, 416-877-8149)



THE ZAX IS BACK! *(Left)*

Here's an update of a *Zaxxon*-type program rewritten in 100-percent machine language by Steve Bjork to take advantage of the CoCo 3's graphics and sound — *Z'89* ($24.95). Call on the best of your arcade skills to defeat the flying fortresses and the evil creature that lurks at its heart. Pilot your spaceship over walls, around forcefields, and fire on anything in your path. Be blown away yourself by smooth 3-D animation and digitized sound effects!

(Game Point Software, P.O. Box 6907, Burbank, CA 91510, 818-566-3571)



BACK IN THE URANIUM MINES *(Left)*

If you thought it was safe to go back in the uranium mines after *Mutant Miners*, think again! Those irradiated radicals are back in *Revenge of the Mutant Miners* ($19.95)! Ten levels deep in the bowels of the earth, you must work your way up a network of ladders and springboards, leaping over areas where the "floor" has collapsed. But above all, you must avoid the mutated miners and seek out *uranimite*, a powerful substance that gives you temporary ability to overcome them.

Revenge of the Mutant Miners is a one- or two-player game for the CoCo 3 and a disk drive. It can be configured for level of difficulty, number of lives for each player, and starting screen: Play at any level you like!

(JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, 805-735-3889)

Make your CoCo multilingual

¿Habla Espanol?

By J.A. Ottum

Your computer can. In fact, you can program a computer in almost any language. Why should you have to learn a foreign language to communicate with your computer when it only uses ones and zeroes? Because of the numerous letters appearing in computer magazines from South America, I chose Spanish to illustrate this technique.

Espanol is written in BASIC, simply load and run. The program will work on any Radio Shack Color Computer system. Please remember to save a copy before you run it the first time, using `SAVE "ESPANOL/BAS"`. You may save it in machine language by first running it and then using `SALVARM"ESPANOL.BIN",31870,32767,31870`. Before reloading, be sure to reserve memory by using the `CLEAR` command. Remember, key words are reserved and cannot be used for variable names. Words reserved by *Espanol* can be found in the tables.

This utility has some nice surprises. Because your BASIC programs are not really changed, that is, the memory in which the program resides is not affected by the program, you can use a program written in English, edit it in Spanish, run it in Greek, and print it in French. Try listing a program on your printer to discover the second surprise. Your printer is also bilingual. If using the ASCII option when saving a program, ensure that the same key word tables are installed when loading. Multilingual, yes, but only one language at a time please.

For 16K users, simply replace lines 10, 20, 40, 200 and 210 with lines 15, 25, 45, 205 and 215 respectively.

When entering a program the key words are converted to and stored as tokens, which are used to store memory. An example of a key word is "Print" and the token associated with this key word is 135. Instead of using five bytes to store the word "print," one byte is used to store the number 135. When you list a program, each token, either one or two bytes long, is looked up in a table and the appropriate key word is printed. Since the addresses of the token tables reside in RAM, you can easily create your own key word tables.

To install a key word table, change this address. BASIC uses two key word tables, one for commands and one for functions. Super, Extended BASIC and Disk BASIC each use two other tables. This gives a maximum of eight key word tables (see the tables). *Espanol* installs all of these tables, but your system will use only those tables that apply.

The tables are installed by executing a simple and short machine language program. This machine language routine is built by the BASIC program, lines 40 through 110 and 200. For those of you studying assembly language, it simply consists of a series of `LDX`s and `STX`s followed by an `RTS`.

The tricky part of creating a key word table is that `128` must be added to the ASCII value of the last letter of each key word. This is used by the tokenize and untokenize routines in BASIC ROM to flag the end of each key word.

Try rewriting this utility in another language. The challenge to writing this program is the interpretation. On your next visit to a favorite bookstore note that there are numerous English-Spanish books, all conversational, none technical. Other possibilities include the use of an alternate character set to handle non-standard characters or development of your own private key words. If you encrypt selected key words you may discover a simple way to protect your favorite programs from being edited, listed or saved without permission. This is accomplished by removing and changing the number of selected key words, by spelling these words in a non-standard format, or by using lower-case key words (see the tables).

(Questions or comments concerning this article may be addressed to the author at 5858 S. Roanoke, Springfield, MO 65807. Please include an SASE if requesting a reply.)

❑

J.A. Ottum is a Lieutenant Commander in the U.S. Navy, presently the commanding officer at the Naval and Marine Corps Reserve Center in Springfield, Missouri. He has worked with computers since 1968 and was first introduced to the Radio Shack Color computer in 1981.

Table 1:

	Number of Keywords	Keyword Address Table	Table of Entry
BASIC Commands	288	289-290	291-292
BASIC Commands	293	294-295	296-297
Extended Commands	298	299-300	301-302
Extended Functions	303	304-305	306-307
Disk Commands	308	309-310	311-312
Disk Functions	313	314-315	316-317
Super Commands	57698	57699-57700	57701-57702
Super Functions	57703	57704-57705	57706-57707

Table 2: BASIC Commands and Functions

English	Spanish	English	Spanish
FOR	PARA	GO	IR
REM	NOTA	'	'
ELSE	SINO	IF	SI
DATA	DATO	PRINT	IMPRESSAR
ON	SOBRE	INPUT	ENTRAR
END	FIN	NEXT	SIGUIENTE
DIM	DECLARAR	READ	LEER
RUN	EMPEZAR	RESTORE	RECOBRAR
RETURN	VOLVER	STOP	PARAD
POKE	METER	CONT	SEGUIR
LIST	LISTA	CLEAR	RESGUARDAR
NEW	NUEVO	CLOAD	CCARGAR
CSAVE	CSALVAR	OPEN	ABRIR
CLOSE	CERRAR	LLIST	LLISTA
SET	PONER	RESET	REPONER
CLS	CLAREAR	MOTOR	MOTOR
SOUND	SONIDO	AUDIO	OIDO
EXEC	COMENZAR	SKIPF	SALTAR
TAB(	TAB(	TO	HASTA
SUB	SUB	THEN	ENTONCES
NOT	NO	STEP	ESCALA
OFF	APAGAR	+	+
-	-	*	*
/	/	@	@
AND	Y	OR	O
>	>	=	=
<	<	SGN	SGN
INT	INT	ABS	ABS
USR	USO	RND	RND
SIN	SIN	PEEK	VER
LEN	LONGITUD	STR$	STR$
VAL	VAL	ASC	ASC
CHR$	CHR$	EOF	EOF
JOYSTK	JOYSTK	LEFT$	IZQUIRDO
RIGHT$	DERECHO	MID$	MEDIO
POINT	PUNTO	INKEY$	TIPO
MEM	MEM		

Note: Lowercase 'y' and 'o' were used to avoid confusion with variables Y and O since 'AND' translates to Y, and 'OR' translates to 'O'

Table 3: Extended BASIC Commands and Functions

English	Spanish	English	Spanish
DEL	BORRAR	EDIT	CAMBIAR
TRON	TRON	TROFF	TROFF
DEF	DEFINIR	LET	DEJAR
LINE	LINEA	PCLS	PCLAREAR
PSET	PPONER	PRESET	PREPONER
SCREEN	PANTALLA	PCLEAR	RESERVA
COLOR	COLOR	CIRCLE	CIRCULO
PAINT	PINTAR	GET	COGER
PUT	APARTAR	DRAW	DIBUJAR
PCOPY	PCOPIA	PMODE	PMODO
PLAY	JUGAR	DLOAD	DCARGAR
RENUM	NUMERO	FN	FN
USING	USAR	ATN	ATN
COS	COS	TAN	TAN
EXP	EXP	FIX	FIX
LOG	LOG	POS	POS
SQR	SQR	HEX$	HEX$
VARPTR	IMPRIMIR	INSTR	INSTR
TIMER	TIEMPO	PPOINT	PPUNTO
STRING$	HILO		

Table 4: Super Extended Commands and Functions

English	Spanish	English	Spanish
WIDTH	ANCHO	PALETTE	PINCEL
HSCREEN	HPANTALLA	LPOKE	LMETER
HCLS	HCLAREAR	HCOLOR	HCOLOR
HPAINT	HPINTAR	HCIRCLE	HCIRCULO
HLINE	HLINEA	HGET	HCOGER
HPUT	HAPARTAR	HBUFF	HBUFF
HPRINT	HIMPRESAR	ERR	ERR
BRK	ROMPER	LOCATE	SITUAR
HSTAT	HSTAT	HSET	HPONER
HRESET	HREPONER	HDRAW	HDIBUJAR
CMP	CMP	RGB	RGB
ATTR	ATTR	LPEEK	LVER
BUTTON	BOTON	HPOINT	HPUNTO
ERNO	ERNO	ERLIN	ERLIN

Table 5: Disk BASIC Commands and Functions

English	Spanish	English	Spanish
DIR	DIR	DRIVE	UNIDAD
FIELD	CAMPO	FILES	ARCHIVO
KILL	CORTAR	LOAD	CARGAR
LSET	LPONER	MERGE	UNIR
RENAME	NOMBRE	RSET	RPONER
SAVE	SALVAR	WRITE	ESCRIBIR
VERIFY	VERIFICAR	UNLOAD	UNCARGAR
DSKINI	ININIAR	BACKUP	DUPLICAR
COPY	COPIA	DSKI$	DSKI$
DSKO$	DSKO$	DOS	DOS
CVN	CVN	FREE	GRANITO
LOC	LOC	LOF	LOF
MKN$	MKN$	AS	COMO

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GA5 - Blackjack, Laser, Raceway, Utopian, +
GA6 - Kings, Navyguns, Poolgame, Subship, +
GA7 - Connect4, F-16, Life, Mazeland, +
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E2
E3
E4

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H2
H3
H4

U1
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U3
U4
U5
U6
U7
U8

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The listing: ESPANOL

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 CLEAR 897,31869
15 'CLEAR 897,15485:'16K USERS
20 P=31919
25 'P=15535:'16K USERS
30 FOR K=1 TO 8
40 G=31865+6*K
45 'G=15481+6*K:'16K USERS
50 READ N,D
60 POKE G-1,142
70 POKE G,INT(P/256)
80 POKE G+1,P-INT(P/256)*256
90 POKE G+2,191
100 POKE G+3,INT(D/256)
110 POKE G+4,D-INT(D/256)*256
120 FOR X=1 TO N
130 READ A$
140 FOR Y=1 TO LEN(A$)
150 POKE P,ASC(MID$(A$,Y,1))
160 P=P+1
170 NEXT Y
180 POKE P-1,128+PEEK(P-1)
190 NEXT X,K
200 POKE 31918,57
205 'POKE15534,57:'16K USERS
210 EXEC 31870
215 'EXEC 15484:'16K USERS
220 '
230 'SUPER EXTENDED COMMAND KEYW
ORDS
240 DATA 23,57699,ANCHO,PINCEL,H
PANTALLA,LMETER,HCLAREAR,HCOLOR,
HPINTAR,HCIRCULO,HLINEA,HCOGER,H
APARTAR,HBUFF,HIMPRESAR,ERR,ROMP
ER,SITUAR,HSTAT,HPONER,HREPONER,
HDIBUJAR,CMP,RGB,ATTR
250 '
260 'SUPER EXTENDED FUNCTION KEY
WORDS
270 DATA 5,57704,LVER,BOTON,HPUN
TO,ERNO,ERLIN
280 '
290 'DISK BASIC COMMAND KEYWORDS
300 DATA 20,309,DIR,UNIDAD,CAMPO
,ARCHIVO,CORTAR,CARGAR,LPONER,UN
IR,NOMBRE,RPONER,SALVAR,ESCRIBIR
,VERIFICAR,UNCARGAR,ININIAR,DUPL
ICAR,COPIA,DSKI$,DSKO$,DOS
310 '
320 'DISK BASIC FUNCTION KEYWORD
S
330 DATA 6,314,CVN,GRANITO,LOC,L
OF,MKN$,COMO
340 '
350 'EXTENDED BASIC COMMAND KEYW
ORDS
360 DATA 25,299,BORRAR,CAMBIAR,T
RON,TROFF,DEFINIR,DEJAR,LINEA,PC
LAREAR,PPONER,PREPONER,PANTALLA,
RESERVA,COLOR,CIRCULO,PINTAR,COG
ER,APARTAR,DIBUJAR,PCOPIA,PMODO,
JUGAR,DCARGAR,NUMERO,FN,USAR
370 '
380 'EXTENDED BASIC FUNCTION KEY
WORDS
390 DATA 14,304,ATN,COS,TAN,EXP,
FIX,LOG,POS,SQR,HEX$,IMPRIMIR,IN
STR,TIEMPO,PPUNTO,HILO
400 '
410 'BASIC COMMAND KEYWORDS
420 DATA 53,289,PARA,IR,NOTA,',S
INO,SI,DATO,IMPRESAR,SOBRE,ENTRA
R,FIN,SIGUIENTE,DECLARAR,LEER,EM
PEZAR,RECOBRAR,VOLVER,PARADA,MET
ER,SEGUIR,LISTA,RESGUARDAR,NUEVO
,CCARGAR,CSALVAR,ABRIR,CERRAR,LL
ISTA,PONER,REPONER,CLAREAR,MOTOR
,SONIDO,OIDO,COMENZAR
430 DATA SALTAR,TAB(,HASTA,SUB,E
NTONCES,NO,ESCALA,APAGAR,+,-,*,/
,^,&,@,>,=,<
440 '
450 'BASIC FUNCTION KEYWORDS
460 DATA 20,294,SGN,INT,ABS,USO,
RND,SIN,VER,LONGITUD,STR$,VAL,AS
C,CHR$,EOF,JOYSTK,IZQUIREDO,DERE
CHO,MEDIO,PUNTO,TIPO,MEM
```

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Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is not an original work.

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—Tony Olive, Curator

1st Place

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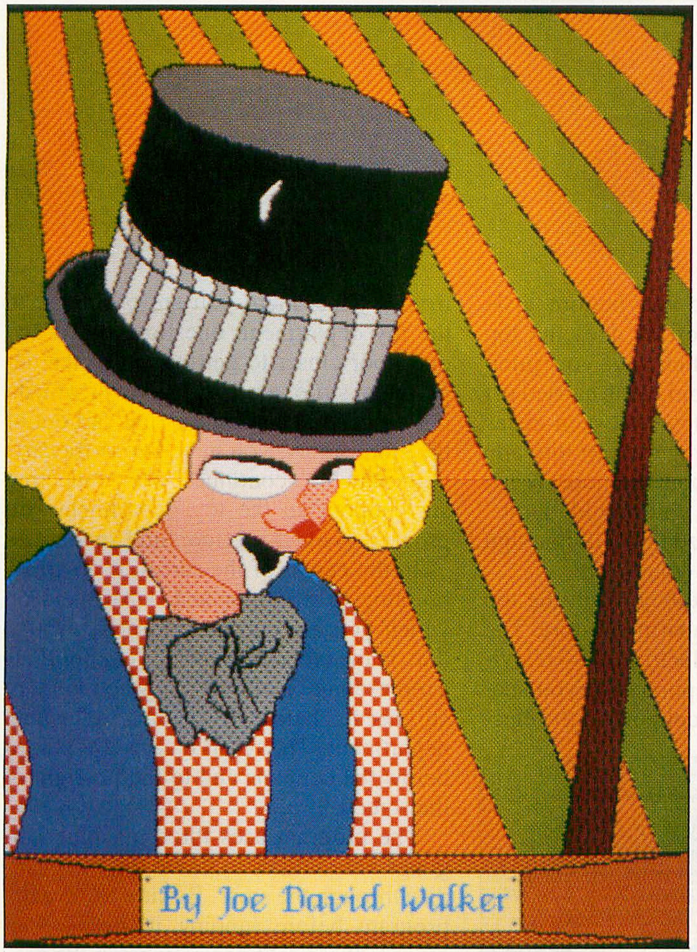
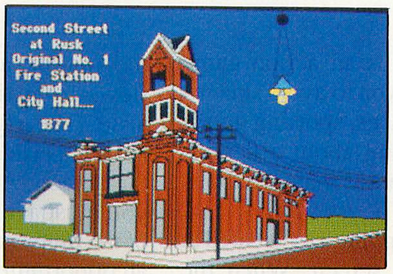


Clown **Joe D. Walker**

Joe, of Jackson, Michigan, has 14 years of experience with IBM mainframes. His hobbies, besides the CoCo, are model railroading and photography. This scene was designed using *CoCo Max III* and printed via Joe's program *Star*Max*.



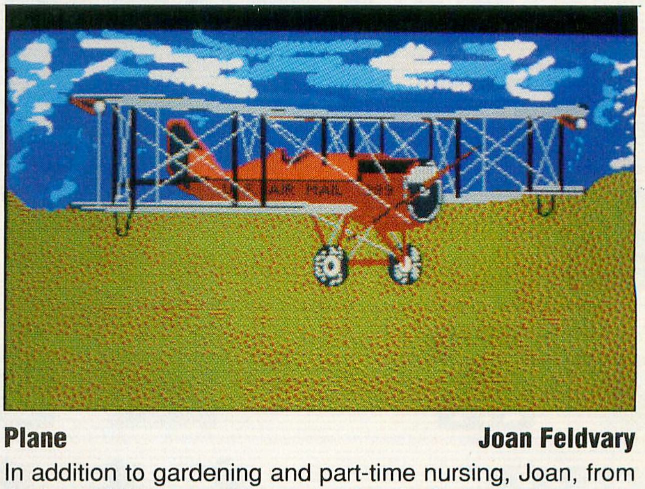
3rd Place

Fire Station No.1
Jim Noah

Jim, a recently retired district fire chief, has combined his hobbies of art and studying the history of the fire department by drawing the original and newer stations from the Fort Worth, Texas area using *CoCo Max III*.

2nd Place

From RAINBOWfest Live — Chicago '89



Plane **Joan Feldvary**

In addition to gardening and part-time nursing, Joan, from Jackson, Michigan, enjoys using her CoCo for desktop publishing, data processing and graphics applications. This plane was generated with *CoCo Max III*.

Dodging moving merchandise and collecting coupons

Shopping Spree

By Curt Coty

Shopping Spree is an action game that challenges you to avoid streams of toys, appliances, sporting goods and other items moving about a department store, and to collect as many coupons as you can.

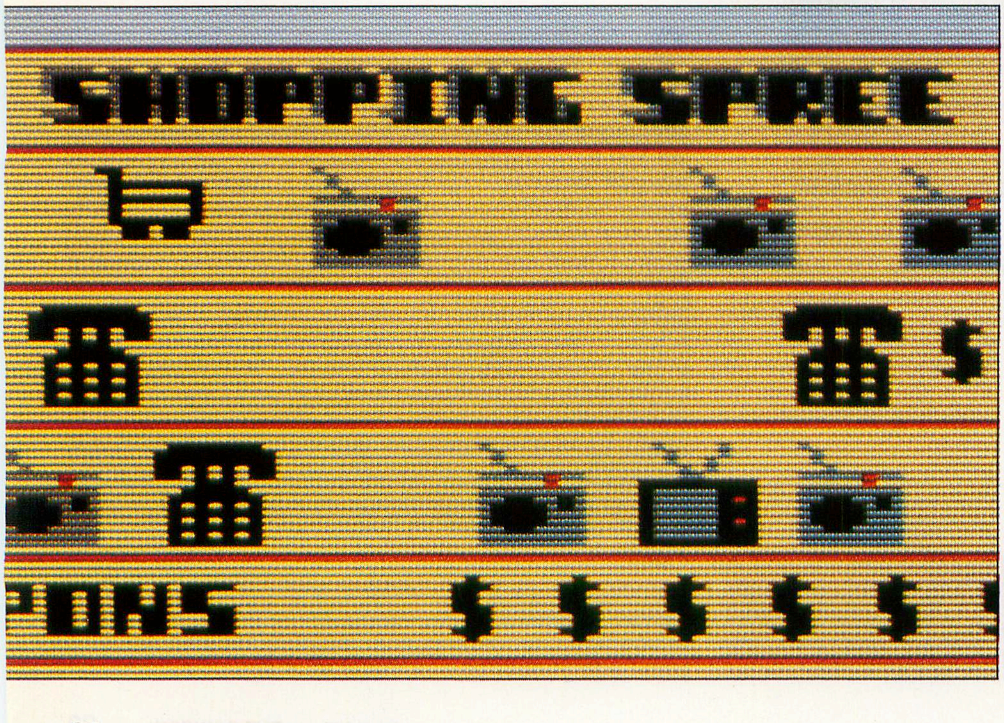
You control the shopping cart located at the top center of the screen. When the game starts there is a beep and the cart begins moving to the left. The items for sale flow from right to left in the top aisle. Flow is directed from the left to the right in the middle aisle, and the bottom aisle flows from right to left as does the top aisle. The right joystick lets you jump between aisles and avoid being carried off the screen. As you move between aisles you must avoid crashing the cart into any of the items moving about the store. When an opportunity occurs you should "jump" on a coupon, symbolized by a dollar sign ($), which determines your score.

The shopping spree begins on the top floor of a five-story department store. The top floor houses the electronics — televisions, radios, and telephones. If you succeed in collecting six coupons in the electronics department you are promoted to the toy department, one floor down and one floor closer to getting out of the department store safely. If, however, you do not succeed in getting the first cart out of the store safely, you have two extra carts with which to continue. After collecting six coupons in the toy department you proceed to the third floor, and so on.

In the center of the screen is an arrow pointing to the floor and department on which you are currently located. Above that, in the rectangle labeled "coupons", is a representation of how many coupons are still needed before descending to the next department. The reserve carts are placed below the coupons and to the far right of the screen.

The program uses three machine language subroutines to move the merchandise through the store. Be sure to save the program before running it, because an error in these routines may crash the program if they are not entered correctly. Also, because the graphics memory changes when a disk controller is plugged into the color computer, the program requires a disk drive. Perhaps some adventurous person can modify the subroutines to work with a tape system. This program uses the high-speed poke for the CoCo 3: `POKE 65497,0` so be sure to press the Reset button before saving it.

(Questions or comments concerning this article may be addressed to the author at 4072 11 Mile Road, Auburn, MI 48611. Please include an SASE when requesting a reply.) ❑



Curt Coty is a computer science student at Michigan State University.

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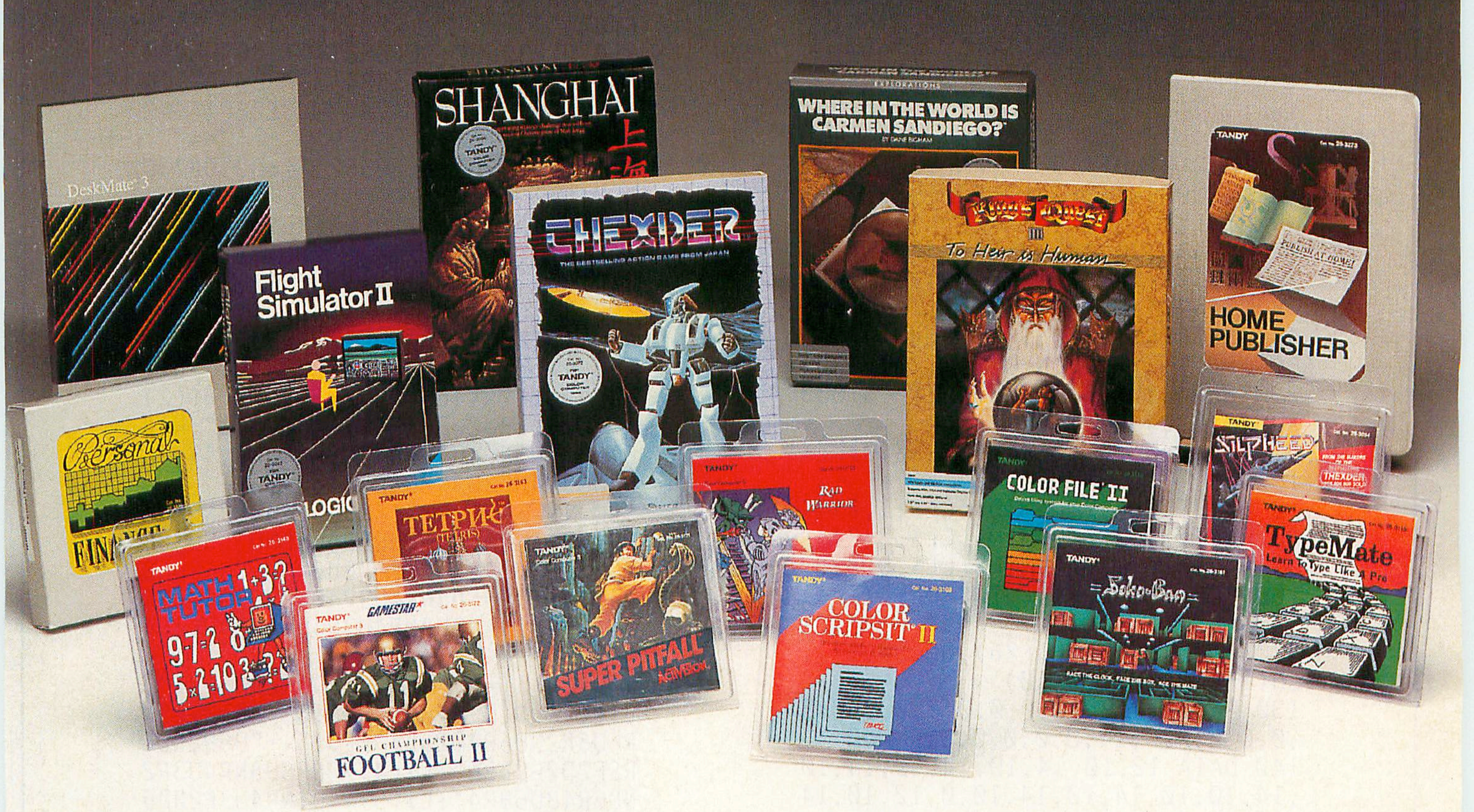
DeskMate 3
SHANGHAI
WHERE IN THE WORLD IS CARMEN SANDIEGO?
CHEXDER
King's Quest III
To Heir is Human
HOME PUBLISHER
Flight Simulator II
Personal Finance
TETRIS
Rad Warrior
COLOR FILE II
SILPHEED
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680	219	2060	162
970	47	2330	37
1200	6	END	1

The listing: SPREE

```
0 ‘ COPYRIGHT 1989  FALSOFT,INC
10 ‘SHOPPING SPREE (C) 1989 BY C
URT COTY
20 CLEAR 500,32500:PCLEAR 7
30 CLS:PRINT”ARE YOU USING A RGB
 MONITOR?”
40 I$=INKEY$:IF I$=”” THEN 40
50 IF I$=”Y” THEN CL$=”620056365
220562563383617" ELSE CL$=”51003
2062015324563210631"
60 FOR X=0 TO 15:PALETTE X,0:NEX
T X
70 PALETTE 4,VAL(MID$(CL$,1,2))
80 PALETTE 5,VAL(MID$(CL$,3,2))
90 PALETTE 6,VAL(MID$(CL$,5,2))
100 PALETTE 7,VAL(MID$(CL$,7,2))
110 CLS0
120 DIM N$(10),L$(26),GD(20,14),
SH(15,10),MT(15,10)
130 DATA 14,8,10,0,0,0,0,0,0,0,8
,0,0,0,0,0,14,8,0,0,0,0,0,0,0
140 DATA 12,10,14,10,14,10,14,10
,14,10,10,14,10,14,10,0,12,10,14
,10,14,5,13,5,13
150 DATA 12,8,8,8,12,8,14,8,14,8
,8,8,8,12,10,0,12,8,14,8,8,5,12,
5,12
160 DATA 0,0,0,0,0,0,8,0,8,0,0,0
,0,12,8,0,0,0,8,0,0,4,12,4,12
170 WIDTH 32:POKE 41382,128:POKE
 65497,0:POKE 63506,33:POKE 6377
2,33
180 FOR C=1 TO 3
190 FOR Y=0 TO 96 STEP 32
200 PRINT @ Y+C*66,””;
210 FOR X=1 TO 25
220 READ D
230 PRINT CHR$(128+16*C+D);
240 NEXT X,Y
250 RESTORE
260 NEXT C
270 PRINT @ 392,”(C) 1989 BY CUR
T COTY”;
280 PALETTE 1,56:PALETTE 2,59:PA
LETTE 3,10:PALETTE 12,59
290 LV=5:SP=LV:NC=0
300 D$=”BR2;D8;U1;L2;R5;U3;L5;U3
;R5"
310 P$=”CBAABCFCBAABCFFGEA”
320 ML$=”8E143EA684A701301F8C124
026F58E14208600A7843088E08C12402
6F639"
330 TT=32500:DEFUSR0=TT:GOSUB390
340 ML$=”8E1021A684A71F30018C11F
F26F58E11FF8600A7843088E08C101F2
6F639"
350 TT=32650:DEFUSR1=TT:GOSUB390
360 ML$=”8E14E1A684A71F30018C16B
F26F58E16BF8600A7843088E08C14DF2
6F639"
370 TT=32550:DEFUSR2=TT:GOSUB390
380 GOTO 410
390 VV=0:FORI=1TOLEN(ML$)STEP2:A
A$=MID$(ML$,I,2):AA=VAL(“&H”+AA$
):POKETT+VV,AA:VV=VV+1:NEXT I
400 RETURN
410 ‘DEFINE CHARACTER SET
420 N$(0)=”NU6R4U6L4R6D6BR4":N$(
1)=”R6UL2NL4U5L2DR2BR6BD5":N$(2)
=”R6UNL2BU2U3L6R4D3L4D3BR10”:N$(
3)=”R6U3NL4U3L6R4D6BR6":N$(4)=”B
U3NU3R4ND3U3R2D6BR4"
430 N$(5)=”UR2DL2R6U3L6U3R2ND3R4
BR4BD6":N$(6)=”NU6R6U3LND3L5U3R6
DL2BR6BD5":N$(7)=”BU6R4D6RU6RD6B
R4":N$(8)=”U3NR4U3R4D6RU6RD6L6BR
10”:N$(9)=”BU3NR4U3R4D6RU6RD6BR4
“
440 L$(0)=”U6R2ND6R4D3NL6D3BR4":
L$(1)=L$(0)+”BL4L6BR10”:L$(2)=”N
R6U6R2ND6R4D2BF4":L$(3)=”U6R2ND6
R2F2D2G2BR6":L$(4)=”NR6U3NR4U3R2
ND6R4BD6BR4":L$(5)=”U3NR4U3R2ND6
R4BD6BR4":L$(6)=”NR6U6R2ND6R4BD4
D2BR4"
450 L$(7)=”U6R2D3ND3R4U3D6BR4":L
$(8)=”R2U6L2R6L2D6R2BR4":L$(9)=”
R2U6L2R6L2D6BR6":L$(10)=”U6R2D2N
M+4,-2ND4F4BR4":L$(11)=”U6R2D6R4
BR4":L$(12)=”U6R2ND6F2E2D6BR4"
460 L$(13)=”U6R2D3R2D3R2NU6BR4":
L$(14)=”U6R6L4D6R4NU6BR4":L$(15)
=”U6R2ND6R4D3L4BD3BR8":L$(16)=”U
6R2ND6R4D6L6R4BU2M+4,+2BR4":L$(1
7)=”U6R2ND6R4D3L4R2M+2,+3BR4":L$
(18)=”R6U3L2ND3L4U3R2ND3R4BD6BR4
“
470 L$(19)=”BU6R2ND6R2ND6R2BD6BR
4":L$(20)=”U6R2D6R4NU6BR4":L$(21
)=”BR2H2U4R2D4F2E2U4BD6BR4":L$(2
2)=”BU2U4R2D6E2F2NU6BR4":L$(23)=
“UE2H2UR2DF2G2DBR4UH2E2UBD6BR4”:
L$(24)=”UR2DL2R6U3NU3L6U3R2D3BR8
BD3":L$(25)=”R6UL2DL4U2M+6,-2U2L
6DR2
480 GOTO 520
490 FORK=1TOLEN(W$):L=ASC(MID$(W
$,K,1)):IFL>64ANDL<91THENL$=L$(L
-65)ELSEIFL=46THENL$=”URDLBR6"EL
```

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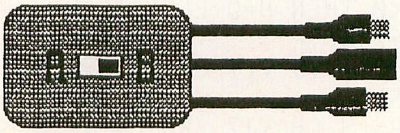
```
SEIFL<48ORL>57THENL$="BR6"ELSEL$
=N$(L-48)
500 DRAW L$:NEXT K
510 RETURN
520 'DRAW SCREEN
530 PMODE3,1:COLOR 8,5:PCLS
540 GET(1,1)-(16,11),MT,G
550 DRAW"BM 20,80;C6":W$="COUPON
S":GOSUB 490
560 FOR X=120 TO 200 STEP 16:DRA
W"BM"+STR$(X)+",73;C6;"+D$:NEXT
X
570 DRAW"BM60,9;S4;C7":W$="SHOPP
ING SPREE":GOSUB 490
580 DRAW"BM62,10;C6":W$="SHOPPIN
G SPREE":GOSUB 490
590 DRAW"BM75,110;C6":W$="FLOOR"
:GOSUB 490
600 DRAW"BM103,125;C6":W$="5 ELE
CTRONICS":GOSUB 490
610 DRAW"BM103,140":W$="4 TOY SH
OP":GOSUB 490
620 DRAW"BM103,155":W$="3 HOUSEW
ARES":GOSUB 490
630 DRAW"BM103,170":W$="2 SPORTI
NG GOODS":GOSUB 490
640 DRAW"BM103,185":W$="1 GROCER
Y":GOSUB 490
650 DRAW"BM3,70;C8;R249;F3;D8;G3
;L249;H3;U8;E3"
660 DRAW"BM3,0;R249;F3;D8;G3;L24
9;H3;U8;E3"
670 DRAW"BM3,88;R249;F3;D97;G3;L
249;H3;U97;E3"
680 COLOR 8,8
690 LINE(0,33)-(255,33),PSET
700 LINE(0,52)-(255,52),PSET
710 CR$="C6;R2;D2;R13;D5;L3;D2;L
2;U2;L4;D2;L2;U2;L1;U3;R12;L12;U
2"
720 DRAW"BM124,17"+CR$
730 DRAW"BM200,96"+CR$:DRAW"BM22
0,96"+CR$
740 GET(124,17)-(139,27),SH,G
750 PCOPY 1 TO 5:PCOPY 2 TO 6
760 GOTO 1660
770 'DRAW TELEVISION
780 PALETTE 6,VAL(MID$(CL$,5,2))
790 PALETTE 7,VAL(MID$(CL$,7,2))
800 DRAW"BM25,121;C7;F5;E5;G5;C6
;R8;D8;L16;U8;R8"
810 PAINT(25,130),6,6
820 COLOR 7,7
830 LINE(24,127)-(32,133),PSET,B
F
840 COLOR 8,8:PSET(36,128):PSET(
36,131)
850 'DRAW RADIO
860 COLOR 7,7
870 LINE(22,145)-(37,154),PSET,B
F
880 LINE(22,141)-(27,145),PSET
890 DRAW"BM22,146;C5;R16"
900 COLOR 6,6
910 DRAW"BM26,148;R3;F1;D2;G1;L3
;H1;U2;E1":PAINT(26,151)
920 DRAW"BM34,148;R1;D1;L1"
930 DRAW"BM32,145;C8;D1"
940 'DRAW TELEPHONE
950 DRAW"BM24,161;C6;R12;F2;D2;L
2;U2;L12;D2;L2;U2;E2;D1;R12"
960 DRAW"BM28,164;C6;D2;R4;U2;D3
;R2;F2;D5;L12;U5;E2"
970 PAINT(30,170)
980 COLOR 5,5
990 FOR X=26 TO 36 STEP 4:PSET(X
,169):PSET(X,171):PSET(X,173):NE
XT X
1000 RETURN
1010 'DRAW TEDDY BEAR
1020 PALETTE 6,VAL(MID$(CL$,9,2)
)
1030 PALETTE 7,VAL(MID$(CL$,11,2
))
1040 DRAW"BM30,122;C6;R4;U1;R2;D
2;L1;D3;G2;D1;R4;E1;G1;L3;D1;F2;
D1;G1;L1;H1;L2;G1;L2;H1;U1;E2;U1
;L3;H1;F1;R4;U2;L2;U4;L2;U2;R2;D
1;R2"
1050 PAINT(32,124),7,6:PAINT(32,
130),7,6
1060 'DRAW TOP
1070 DRAW"BM28,141;C6;R5;L2;D3;R
4;D1;R2;G7;U1;H5;U1;R2;U1;R4"
1080 PAINT(28,146),7,6
1090 DRAW"BM28,145;C8;R4;BD2;R1;
L5;R2;BD2;R1"
1100 'DRAW SHIP
1110 COLOR 6,5
1120 DRAW"BM22,169;C8;F5;R8;E5;L
16"
1130 PAINT(30,172),7,8
1140 DRAW"BM30,168;C7;U7;R2;F6;L
4;H1"
1150 RETURN
1160 'DRAW MIXER
1170 PALETTE 6,VAL(MID$(CL$,13,2
))
1180 PALETTE 7,VAL(MID$(CL$,15,2
))
1190 DRAW"BM26,121;C6;R8;F2;D2;G
1;L6;D6;R8;D2;L12;U11;E2"
1200 PAINT(30,123),8,6
1210 DRAW"BM34,127;C7;D2;R2;D2;L
3;U2;R1"
1220 'DRAW COFFEE POT
1230 DRAW"BM28,141;C7;R1;D2;R2;F
2;D8;L8;U8;E2;R2;L2;G2;L2;D1
1240 DRAW"BM34,145;C6;R2;D4;L2"
1250 PAINT(30,147),7,7
```

```
1260 'DRAW CLOCK
1270 DRAW"BM28,161;C6;R6;F4;D5;G
3;L7;H3;U6;E3"
1280 PAINT(28,164),7,6
1290 DRAW"BM30,167;C6;U4;D4;R3
1300 COLOR 8,6
1310 PSET(30,163):PSET(36,167):P
SET(26,167):PSET(30,172)
1320 RETURN
1330 'DRAW RAQUET
1340 PALETTE 6,VAL(MID$(CL$,17,2
))
1350 PALETTE 7,VAL(MID$(CL$,19,2
))
1360 DRAW"BM22,127;C6;R7;U2;E3;R
4;F3;D5;G3;L4;H3;U2;L7"
1370 PAINT(35,125),7,6
1380 'DRAW BASKETBALL
1390 DRAW"BM26,142;C8;R8;F2;D6;G
2;L8;H2;U6;E2"
1400 PAINT(30,145),8,8
1410 DRAW"BM25,143;C6;D1;R2;D6;L
2;D1"
1420 DRAW"BM36,143;C6;D1;L2;D6;R
2;D1"
1430 DRAW"BM30,143;C6;D9"
1440 'DRAW FOOTBALL HELMET
1450 DRAW"BM30,161;C6;R3;F3;D5;L
3;D5;L8;U1;H2;U7;E3;R2"
1460 PAINT(30,165),8,6
1470 DRAW"BM30,172;C6;R8"
1480 RETURN
1490 'DRAW BOTTLE
1500 PALETTE 6,VAL(MID$(CL$,21,2
))
1510 PALETTE 7,VAL(MID$(CL$,23,2
))
1520 DRAW"BM29,121;C6;R1;D4;R3;D
9;L7;U9;R3;U4"
1530 PAINT(30,129),7,6
1540 'DRAW APPLE
1550 DRAW"BM28,143;C7;R4;F4;D4;G
3;L4;H4;U3;E4"
1560 PAINT(30,145),7,7
1570 DRAW"BM30,143;C8;E2;G2;H2"
1580 COLOR 5,5
1590 PSET(32,145):PSET(32,146)
1600 'DRAW BOX
1610 DRAW"BM24,173;C6;U7;R6;D7;L
6;R7;E5;U7;G5;L7;E5;R6"
1620 PAINT(28,170),8,6
1630 PAINT(30,165),8,6
1640 PAINT(34,168),8,6
1650 RETURN
1660 WIDTH 32:SCREEN 1,1
1670 PLAY"T10;L2;O3"
1680 DRAW"BM50,45;C8;":W$="PRESS
 FIRE BUTTON":GOSUB 490
1690 FOR X=1 TO LEN(P$)
1700 PLAY MID$(P$,X,1)
1710 IF BUTTON(0)=0 THEN NEXT X
ELSE 1730
1720 GOTO 1690
1730 PCOPY 6 TO 2
1740 RC=3
1750 'START PROG
1760 PLAY"T10;L10;O2"
1770 DS=200
1780 H=124:V=-1:V1=-1:CH=0:CV=0
1790 COLOR 5,5
1800 PCOPY 5 TO 1
1810 LINE(0,36)-(255,50),PSET,BF1820
LINE(0,54)-(255,69),PSET,BF
1830 ON LV GOSUB 1490,1330,1160,
1010,770
1840 IF SP<>1 THEN SP=LV
1850 DRAW"BM85,"+STR$(117+(5-LV)
*15)+";C8;F5;G5;E3;L10;R10;BU4;L
10"
1860 SOUND 150,5
1870 J=JOYSTK(0):J1=JOYSTK(1)
1880 V1=V
1890 IF J1=63 THEN IF V<1 THEN V
=V+1:PLAY"BBA"
1900 IF J1=0 THEN IF V>-1 THEN V
=V-1:PLAY"BBA"
1910 IF V<>V1 THEN IF PPOINT(H,4
1+20*V)=5 AND PPOINT(H+15,41+20*
V)=5 AND PPOINT(H+7,42+20*V)=5 T
HEN PUT(H,37+20*V1)-(H+15,47+20*
```



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```
V1),MT,PSET:PUT(H,37+20*V)-(H+15
,47+20*V),SH,PSET: ELSE GOSUB 20
70
1920 FOR C=1 TO (SP-1)*20:NEXT C
1930 U=USR0(0):U=USR1(0):U=USR2(
0)
1940 C1=C1+1:C2=C2+1:C3=C3+1
1950 IF V=0 THEN H=H+8 ELSE H=H-
8
1960 IF CH<>0 THEN IF CV=0 THEN
CH=CH+8 ELSE CH=CH-8
1970 IF CH<0 OR CH>245 THEN CH=0
1980 IF H<0 OR H>235 THEN 2070
1990 R=RND(3+SP):O=RND(3):W=RND(
3)
2000 GET(20,101+20*O)-(40,115+20
*O),GD,G
2010 IF W=2 THEN HP=2 ELSE HP=23
4
2020 IF R=1 AND C1>3 THEN PUT(23
5,17)-(255,30),GD,PSET:C1=1
2030 IF R=2 AND C2>3 THEN PUT(0,
36)-(20,50),GD,PSET:C2=1
2040 IF R=3 AND C3>3 THEN PUT(23
5,55)-(255,68),GD,PSET:C3=1
2050 IF R=4 AND CH=0 AND PPOINT(
HP,W*20+4)=5 THEN CV=W-2:DRAW"BM
"+STR$(HP)+","+STR$(CV*20+38)+"C
6;"+D$:CH=HP:IF W=1 THEN C1=1 EL
SE IF W=2 THEN C2=1 ELSE C3=1
2060 GOTO 1870
2070 'CART CRASHED
2080 IF H<0 THEN H=0 ELSE IF H>2
45 THEN H=245
2090 PUT(H,37+20*V1)-(H+15,47+20
*V1),MT,PSET
2100 IF ABS(H-CH)<17 AND CV=V TH
EN 2340
2110 FOR X=1 TO 10
2120 PUT(H,37+20*V)-(H+15,47+20*
V),SH,PRESET
2130 PLAY"CAA"
2140 PUT(H,37+20*V)-(H+15,47+20*
V),SH,PSET
2150 NEXT X
2160 FOR X=1 TO 500:NEXT X
2170 RC=RC-1:IF RC=0 THEN 2220
2180 COLOR 5,5
2190 IF RC=2 THEN LINE(220,90)-(
240,110),PSET,BF
2200 IF RC=1 THEN LINE(200,90)-(
220,110),PSET,BF
2210 GOTO 1780
2220 PALETTE 7,VAL(MID$(CL$,15,2
))
2230 WIDTH 40:ATTR 5,7:CLS8
2240 M$="GAME OVER"
2250 FOR X=1 TO LEN(M$)
2260 FOR Y=0 TO 16
2270 LOCATE X+15,Y
2280 PRINT MID$(M$,X,1);
2290 NEXT Y:SOUND 200,1:NEXT X
2300 LOCATE 9,18:PRINT"YOU COLLE
CTED";NC;"COUPONS";
2310 LOCATE 13,20:PRINT"TRY AGAI
N (Y/N)";
2320 I$=INKEY$:IF I$="" THEN 232
0
2330 IF I$="Y" THEN LOCATE 12,20
:ATTR 5,7,B:PRINT"RE-ENTERING ST
ORE";:NC=0:LV=5:SP=LV:GOTO 520:
ELSE IF I$="N" THEN POKE 65496,0
:END: ELSE 2310
2340 'CART LANDED ON COUQON
2350 NC=NC+1
2360 DRAW"BM"+STR$(CH)+","+STR$(
CV*20+38)+"C5;"+D$
2370 PUT(H,37+20*V)-(H+15,47+20*
V),SH,PSET
2380 IF PPOINT(H-1,42+20*V)<>5 O
R PPOINT(H+17,42+20*V)<>5 THEN G
OTO 2110
2390 PLAY"T10;L10;O2;CCDDEEFFCAD
AE"
2400 DRAW"BM"+STR$(DS)+",73;C5"+
D$
2410 DS=DS-16:CH=0
2420 IF DS=104 THEN 2440
2430 RETURN
2440 'NEW LEVEL
2450 PLAY"T10;L5;O2;CFABDAFA"
2460 LV=LV-1
2470 COLOR 5,5
2480 LINE(20,115)-(100,175),PSET
,BF
2490 COLOR 7,7:FOR X=120 TO 200
STEP 16:DRAW"BM"+STR$(X)+",73;C6
;"+D$:NEXT X
2500 IF LV=0 THEN GOTO 2520
2510 GOTO 1750
2520 'ESCAPED FROM STORE
2530 FOR X=1 TO 40
2540 PCOPY 1 TO 7:PCOPY 2 TO 1:P
COPY 3 TO 2:PCOPY 4 TO 3:PCOPY 7
 TO 4
2550 NEXT X
2560 COLOR 5,5:LINE(0,36)-(255,5
0),PSET,BF
2570 DRAW"BM30,45;C8":W$="YOU ES
CAPED THE STORE":GOSUB 490
2580 FOR X=1 TO 3:SOUND 100,3:FO
R Z=1 TO 500:NEXT Z,X
2590 COLOR5,5:LINE(0,36)-(255,50
),PSET,BF
2600 DRAW"BM25,45;C8":W$="PREPAR
E FOR NEXT LEVEL":GOSUB 490
2610 PLAY "T10;L2;O3"+P$+P$+"T5;
L2;AA"
2620 COLOR 5,5:LINE(20,115)-(100
,190),PSET,BF
2630 LV=5
2640 GOTO 1750
```

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The Rascan Video Digitizer is a state-of-the-art image processing system designed to take advantage of your Color Computer 3's graphic capabilities.

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FEATURES	**RASCAN**		**DS-69b**	
	YES	**NO**	**YES**	**NO**
Support of 640 x 200 16 Level Grey Images	X			X
Support of 640 x 200 4 Level Grey Images	X			X
Support of 320 x 200 16 Color Images	X			X
Support of 4096 Hi-Res Color Graphics in 512K mode	X			X
Support of Multiple Image Buffers in 512K mode	X			X
Control of Contrast & Brightness via Control Knobs found on Digitizer	X			X
Professional, Easy to Use Pop-Up Menu System	X			X
Designed Exclusively to Take Advantage of the power of the Color Computer III	X			X
Built in Histograph Utility to Aid in Image Quality	X			X
Easy to use Paint and Palette editing, no need for additional Graphic editors	X			X
15 Day Full Money Back Guarantee	X			X
Interface through Joystick Ports	X			X
Requires additional cost of Y-Cable or Multi-Pak interface		X	X	

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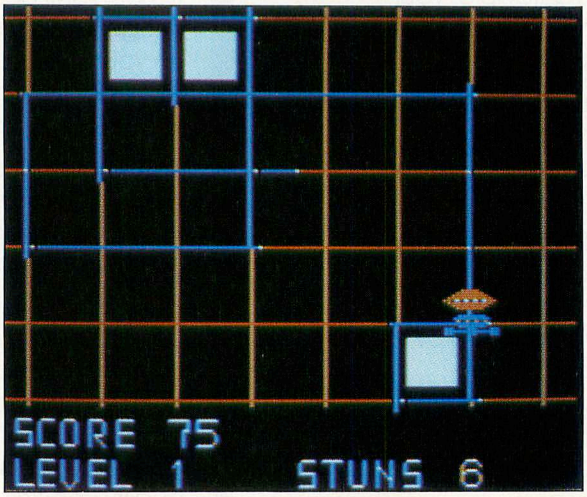
Neutralize the force fields before the enemy ships strike. . . .



The Tholean Web

By Thomas J. George

On a journey through deep space your starship encounters a web-like maze of pure energy constructed by the Tholeans — alien beings no human has seen before. Sensors indicate the maze consists of three levels and your trapped ship must neutralize the force fields holding it by passing over them before the enemy ships can overtake and destroy you.

Tholean Web is an action/arcade game consisting of two parts — a BASIC program (`WEBBAS`, Listing 1) and a machine language program, `WEB.BIN`. Listing 2, `WEBDAT` creates this machine language binary file. It contains check sums for each line and indicates if a typing error has been made. Note: You cannot run `WEBBAS` immediately after running `WEBDAT` without first clearing memory either by a cold start-up (`POKE113,0:EXEC40999`) or turning the computer off briefly. Line 10 in Listing 1 cannot be deleted or changed. If it is, the program erases itself from memory soon after starting. The speedup `POKE` is used in lines 5050 and 5070. If your CoCo will not accept this poke you can delete these two lines. The machine language program is "hard coded" at address 14000 and cannot be relocated in memory without changing the code.

Game Play

When `WEBBAS` is run a test screen appears; if it is red press any key to continue, if it is blue, press Reset and type `RUN` until the screen is red. When the title screen stops, press the fire button to start play. Using the right joystick you must move around the maze and change the red lines to blue. When a square is cleared it is filled and score points are awarded. When all the squares are filled, the next level is entered.

You cannot destroy the enemy ships, but you can stun them briefly using the fire button. If you survive Level three you are awarded 500 bonus points. You can continue to play by pressing Y at this point, and you will return to Level one with your current score. If your ship is hit, pressing Y restarts the game and N clears memory and restarts the computer. You continue to score as long as you survive. Ten stuns are given for each level. Use them carefully. Each level you advance your stuns will have less and less effect. Good luck, Captain!

(Questions or comments concerning this article may be addressed to the author at 1700 Huntingdon Pike, #904, Huntingdon Valley, PA 19006. Please include an SASE when requesting a reply.) ❑

Tom George holds a Ph.D. in organic chemistry and is a specialist in clinical chemistry with a Philadelphia area hospital. His computer interests are in assembly language and the OS-9 operating system.

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Editors Note: The machine language file, `WEB.BIN`, *created by the program in Listing 2 is included on this month's* RAINBOW ON TAPE/DISK.

80 212
310 105
580 235
3050 105
END 233

Listing 1: WEBBAS

```
0 REM ** LINE 10 IS SOFTWARE PRO
TECTED! DO NOT DELETE OR CHANGE!
5 ‘ COPYRIGHT 1989  FALSOFT,INC
10 CLS:PRINT@195,”(C)1986 BY THO
MAS J GEORGE”
20 CLEAR200,14000:DIMN$(11):LOAD
M”WEB”:PMODE4,1:POKE179,2:PCLS:S
CREEN1,1
30 IFINKEY$=””THEN30
40 PCLS0:PMODE3,1
50 A=14000:B=A+1:B1=A+3:B2=A+4:C
=A+2:D=15359:E=A+5:F=14255:G=148
84:H=14738:I=15337:J=15503:Z=155
29
60 DRAW”BM57,74S3C3BD8R6ND12R6BR
8BU8BR12BD20U12L12ND12U8BR28BD20
L8U12NR8BD6R8BR30BU6R6ND12R6BR8B
U8BR12BD20U12L12ND12U8BR28BD20L8
U12R8D12BR8BU20D20R10BR15BU1L8U1
2NR8BD6R8BR18BD7U12L10ND12BD6R10
BR18BD7U12L10ND12"
70 DRAW”BM118,105S3D12L12U12BR6D
12BR28L12U12NR12BD6R12BR8BU6R12D
12L12U12U8":EXECZ
80 PMODE4,1:FORK=1TO100
90 X1=RND(250):Y1=RND(185)
100 PSET(X1,Y1,3):NEXT
110 FORX=1TO2000:NEXT:PMODE3,1
120 FORX=2TO0STEP-1
130 COLORX,3
140 L=0:M=255:N=0:O=191
150 LINE(L,N)-(M,O),PSET,B
160 L=L+2:M=M-2:N=N+3:O=O-3
170 IFL>45THEN190
180 IFL<255THEN150
190 NEXT
200 P=PEEK(65280):IFP=126OR P=25
4THEN210ELSE200
210 N$(0)=”BRNR2HU3ER2FD3GBR3"
220 N$(1)=”BR2U5NGBD5BR4"
230 N$(2)=”BU5R3FDGL3D2R4BR2"
240 N$(3)=”BU5R3FGNL2FDGNL3BR3"
250 N$(4)=”BU5D3R3NU3NRD2BR3"
260 N$(5)=”R3EUHL3U2R4BD5BR2"
270 N$(6)=”BUNUFR2EUHL2GU2ER2FBD
4BR2"
280 N$(7)=”BU5R4D2LD3BR3"
290 N$(8)=”BRHUEHER2FGNL2FDGNL2B
R3"
300 N$(9)=”BUFR2EU3HL2GDFR2EBD3B
R2"
310 N$(10)=N$(1)+N$(0)
320 W$=”BR16U8R6D3NL6D5BU8BR6NR6
D8R6U4L2BR8BD4U8R6D4NL6D4BR6U8BR
6D1ND7F6D1U8BR10ND2R6D4L4D2BD2D”
330 SC=0:NO$=””:CT=33:GOTO1010
500 REM ** BOARD SET-UP
510 EXECD:POKE178,2:CT=CT-1:POKE
J,CT
520 DRAW”S4BM12,1ND156BR32ND156B
R32ND156BR32ND156BR32ND156BR32ND
156BR32ND156BR32ND156BM0,5NR250B
D30NR250BD30NR250BD30NR250BD30NR
250BD30NR250”
530 POKE178,3
540 DRAW”BM129,189R6U5L6U4ER5BR8
BD10U10L4R8BR4D9FR4EU9BR6D10U8F6
U8D10BR6R6U5L6U4ER5BR18BD10S8"+N
$(S)
550 DRAW”S4BM7,173R6U5L6U5R6BR10
L5GD8FR5BR4BUNFU8ER4FD8GL4BR11U1
0R5FD4GL3F4BR6U10NR6D5NR6D5R6"
560 DRAW”S4BM7,189NU10R7BR3U10NR
6D5NR6D5R6BR4BU10D8F3E3U8BD10BR6
```

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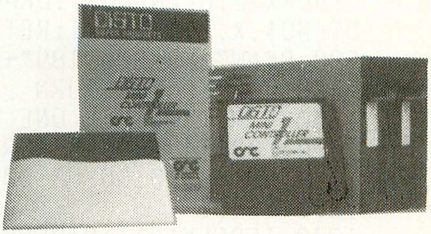

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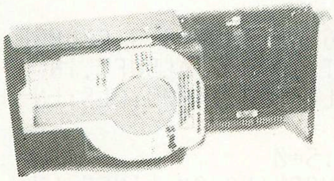

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```
U10NR6D5NR6D5R6BR4NU10R7BR17S8"+
N$(L)
570 NO$=STR$(SC):DRAW”S8BM73,173
“:FORX=2TOLEN(NO$):DRAWN$(VAL(MI
D$(NO$,X,1))):NEXT:RETURN
580 DRAW”S8BM200,189"+N$(S-1):S=
PEEK(C):EXECF:RETURN
1000 REM ** LEVEL ONE
1010 PMODE4,1:PCLS:SCREEN1,1
1020 L=1:S=10:GOSUB500:EXECG
1030 EXECE
1040 IFPEEK(B)<>0THEN5000ELSEIFP
EEK(C)<>S THENGOSUB580:GOTO1040E
LSESC=SC+25:GOSUB570:IFPEEK(A)=3
5THEN2010
1050 GOTO1030
2000 REM ** LEVEL TWO
2010 L=2:S=10:PCLS:GOSUB500:EXEC
G
2020 DRAW”S4C0BM76,37D26BM76,97D
26BM172,37D26BM172,97D26C1"
2030 EXECE
2040 IFPEEK(B)<>0THEN5000ELSEIFP
EEK(C)<>S THENGOSUB580:GOTO2040E
LSESC=SC+30:GOSUB570:IFPEEK(A)=2
7THEN3000
2050 GOTO2030
3000 REM ** LEVEL THREE
3010 L=3:S=10:PCLS:GOSUB500:EXEC
G
3020 DRAW”S4C0BM76,37D86BM172,37
D86BM54,65R42BR54R44BM54,95R42BR
54R44C1"
3030 EXECE
3040 IFPEEK(B)<>0THEN5000ELSEIFP
EEK(C)<>S THENGOSUB580:GOTO3040E
LSESC=SC+35:GOSUB570:IFPEEK(A)=2
3THEN4010
3050 GOTO3030
4000 REM ** END ROUTINE
4010 PCLS:EXECG:FORZ=1TO90:X=RND
(250):Y=RND(160):PSET(X,Y,3):NEX
T
4020 SC=SC+500:EXECD:EXECH:EXECI
:GOSUB550
4030 DRAW”S4BM44,114F4NE4D4BR10U
8R6D8L6BR12NU8R6U8BR8D4BE4BR2D5F
3E3U5BR6NR6D4NR6D4R6BR22NR6U4NR6
U4R6BR6NR6D4R6D4L6BR12NR6U8R6BR6
ND8R6D3NL6D5BR6U8R6D4L6BR12BU4NR
6D4NR6D4R6BR6U8R4F2D4G2L4BR12U2B
U2U4"
4040 DRAW”BM66,137U8R6D4L6BR12NU
4D4R6BR6U8R6D3NL6D5BR8U4NH4E4BD8
;XW$;”
4050 A$=INKEY$:IFA$=”Y”THEN1010E
LSEIFA$=”N”THENPOKE113,0:EXEC409
99ELSE4050
5000 REM ** END GAME
5010 AA=PEEK(B1):BB=PEEK(B2)
5020 DD=((AA*256)+BB)-3584
5030 Y=INT(DD/32)
5040 X=INT(((DD/32)-Y)*256)
5050 POKE65495,0
5060 PMODE3,1:FORK=1TO31:CIRCLE(
X+12,Y+3),K,3:PLAY”L102T255V”+ST
R$(K)+”EDCFADBEA”:NEXT:PMODE4,1:
FORK=31TO1STEP-1:CIRCLE(X+12,Y+3
),K,0:PLAY”L102T255V”+STR$(K)+”E
DCFADBEA”:NEXT
5070 POKE65494,0
5080 EXECI:GOSUB550
5090 DRAW”S4BM136,171R6U4L6U4R6B
R4D8BR6U4NL5U4BR6D8BR6U8R6D4L6BR
22BU4D8R5BR3U8R6D8L6BR10R6U4L6U4
R6BR4R8L4D8"
5100 DRAW”BM128,179R8L4D8BR8U8R6
D4L6BR2F4BU8BR4F4NE4D4;XW$;”
5110 A$=INKEY$:IFA$=”Y”THEN330EL
SEIFA$=”N”THENPOKE113,0:EXEC4099
9ELSE5110
5120 REM ** END OF LISTING
```

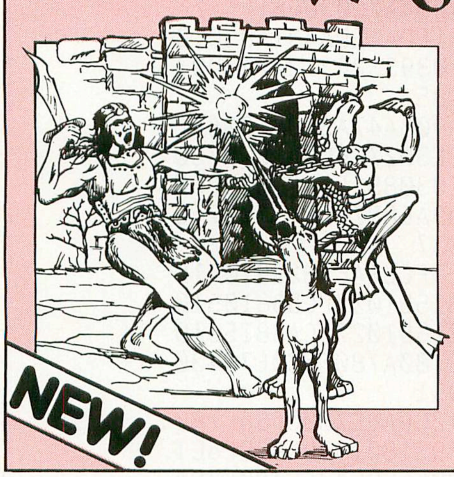
✓
130 191
210 116
280 183
END 254

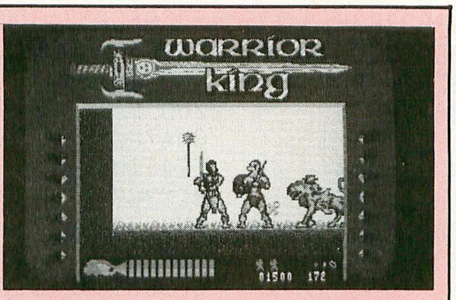
Listing 2: WEBDAT

```
0 REM (C)1986 BY THOMAS J GEORGE
5 ‘ COPYRIGHT 1989  FALSOFT,INC
10 PCLEAR1:CLEAR70,14000:CLS:LN=
100:P=14000
20 READ L$,C:S=0
30 PRINT@0,”WORKING ON LINE”;LN
40 FOR X=0 TO 63
50 V=VAL(“&H”+MID$(L$,X*2+1,2))
60 POKE P,V:S=S+V:P=P+1:NEXTX
70 IF C<>S THEN PRINT”DATA ERROR
 IN LINE”;LN:END
80 LN=LN+10:IF P<15728 THEN 20
90 CLS:SAVEM”WEB/BIN”,14000,1572
8,14000:PRINT”WEB/BIN SAVED TO D
ISK”
100 DATA “FFFF0000FFAD9FA00AB601
5AF6015BBE3D05810E2523812D221FC1
0C221BBD394D3089FF60A68861841881
081027008F8110102700891600898132
252BC10C22", 5597
110 DATA “0316007EC10E2519C12D22
15BD392C3001A6886284188108276581
102761160061C13225321600 5A810E25
20812D221CC1322518BD394D308900A0
A689008184", 4711
120 DATA “188108273A811027361600
36C13225078100C222B16002B810C1022
```

SUNDOG SYSTEMS

Warrior King





Become RASTANN, Warrior King, on the quest to regain his rightful crown, hidden deep within a sinister land. Battle monsters, gain magic and weapons, and travel through harsh wilderness and dark castle dungeons in this medieval realm. From the creator of *Kung-Fu Dude* comes this awesome arcade game for the CoCo III! *Warrior King* uses the most detailed 320x200 16 color graphics and high speed machine code to vault you into a world of fantasy. Dare ye challenge the many perils ahead in order to become WARRIOR KING? Req. 128K CoCo III, disk drive, and joystick. Only $29.95.

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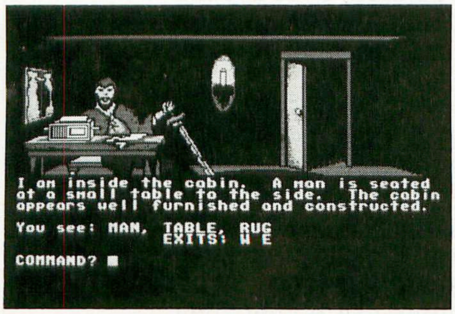

```
I am inside the cabin.  A man is seated
at a small table to the side.  The cabin
appears well furnished and constructed.

You see: MAN, TABLE, RUG
         EXITS: N E

COMMAND? ■
```

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— *8/88 Rainbow review*

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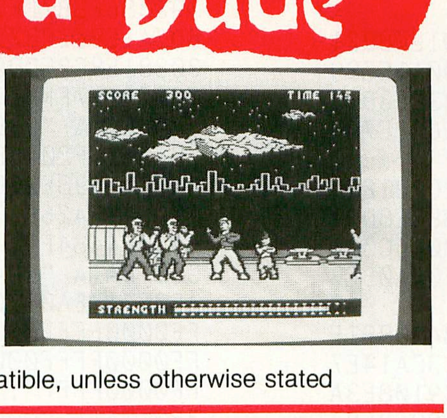
— *2/88 Rainbow review*



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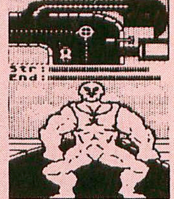

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```
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8108271081102 70C200D810E2206C10E
22022003BF”, 3642
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C4FCCA02E780A780E6C0C43FCA80E784
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B63CED8154", 6873
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350 DATA “4D4153604A6047454F5247
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FF0000FFFF”, 7505
360 DATA “0000FFFF0000FFFF0000FF
FF0000FFFF0000FFFF0000FFFF0000FF
FF0000FFFF0000FFFF0000FFFF0000FF
FF0000FFFF0000FFFF0000FFFF0000FF
FF0000FFFF”, 8160
370 REM ** END IF LISTING
```

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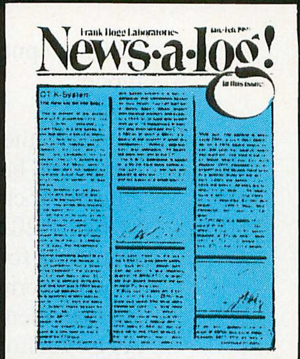

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The second in a series of articles developing a new, talking spelling tutor

EduSpell

Part II: The Dictionary

By Samuel D. Johnson

If you are either a teacher or a parent with kids in school, I'm sure there have been times when you wished you could use your computer to make your students' studies more effective. However, much of the software marketed falls short of fulfilling this goal, and many people simply do not have the time or expertise to write their own programs.

CoCo users, though, have a tremendously versatile computer that is comparable in power to some computers costing several times more. I recently had occasion to use a PC clone and CoCo, one after the other, to download some files from Delphi. I handled the PC first, then disconnected the modem and went online with CoCo, the first time I had ever done both during the same day. The same protocol and 1200 baud were used for both, yet the online screen updates and error checking in downloading were significantly quicker using a 2MHz CoCo than a 5MHz PC.

The CoCo's peripheral support is as good or better than any computer on the market, and now that the software gurus are getting back on board the CoCo train, the Color Computer stands tall in any applications environment.

Speech programs are on the forefront of advanced laboratory software development, and good speech synthesis programs are now developed for the CoCo with a number of different speech synthesizers. But due, most likely, to a lack of applications, Tandy has let both the Speech/Sound cartridge (S/SC) and required Multi-Pak Interface slip out of production. However, any speech capability can be used. All you need to do is change the *EduSpell* subroutines that enable a synthesizer to use commands.

I began working on *EduSpell*, using a 64K CoCo 2, and now use a 128K CoCo 3. The program works fine, including the Speech Synthesizer.

Samuel Johnson, a Lieutenant Commander in the U.S. Navy, is currently stationed in Charleston, South Carolina. He is an honor graduate of Vanderbilt Uniersity and holds an electrical engineering degree. His username on DELPHI is SDJ9060.

The *EduSpell* System

EduSpell, introduced in the December 1988 issue (Page 42) pushes CoCo to the limits of its Disk Extended Color BASIC operating envelope, with a set of programs that improve spelling.

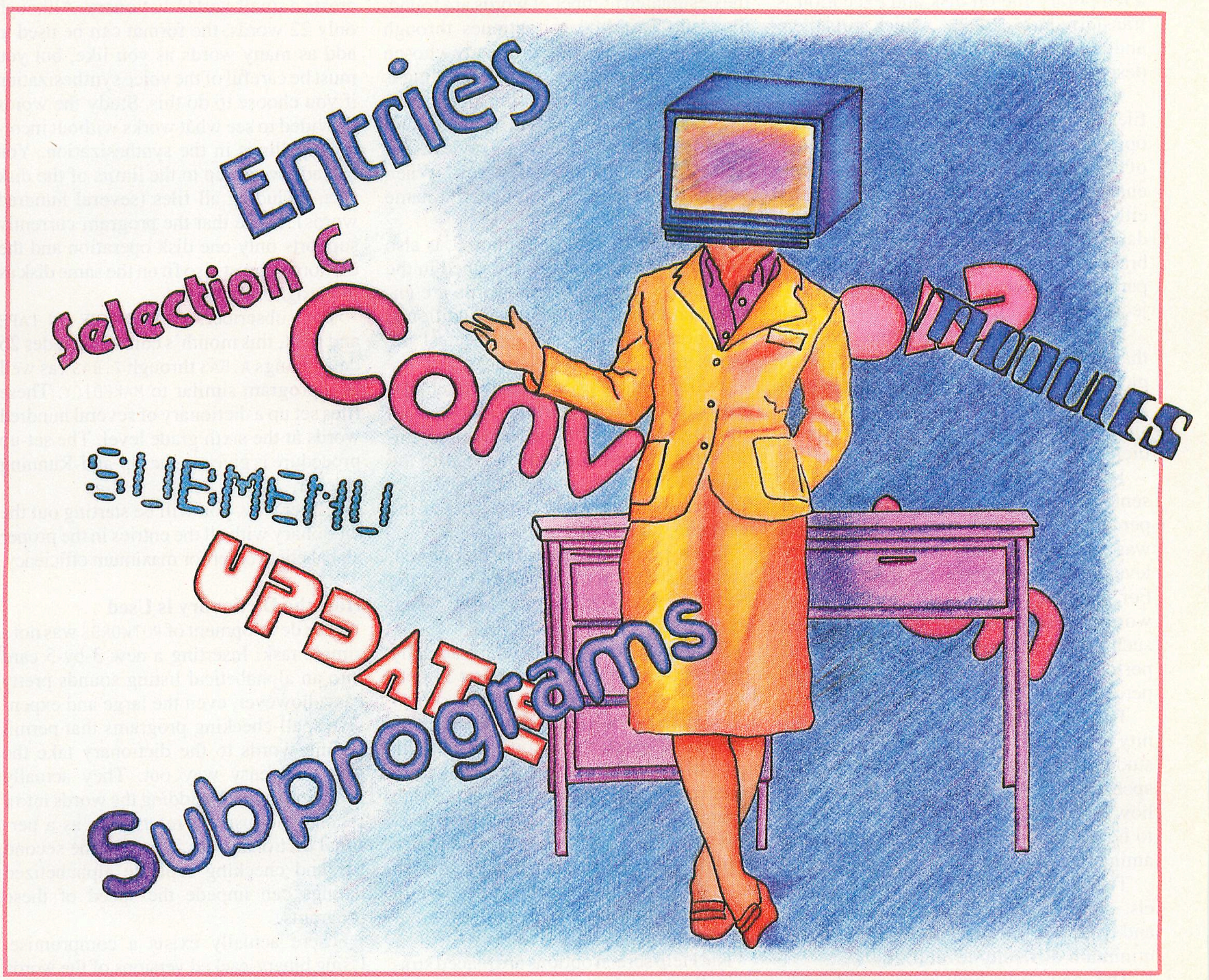
In the first article we built a basic system to build and administer spelling tests, using the Tandy Speech/Sound Cartridge (S/SC), consisting of four listings:

`ROMRAM`: puts the CoCo in the all-RAM mode

`SPELLER`: the main program for entering words and building tests. When words are entered, it creates a "word" consisting of 51 bytes: 20 for the correct spelling of the word; 20 for the synthesized version to enhance correct pronunciation, and 11 data bytes to identify a word's difficulty level. As in Version 1, `SPELLER` has the capability to build test files using the words you enter, and saves them in a file as a test that can be individually administered orally as many times as you want via the S/SC. Several tests can be stored on a single disk because each has its own name. Version 1 also has the ability to immediately run the testing program by selecting the appropriate option after entering and editing all the desired words.

`TAKETEST`: orally administers the spelling tests. It performs other functions beyond simply asking spelling words. With Version 1, `TAKETEST` keeps a running score and congratulates or chides the student.

`SETHELP`: a program that is only run during system setup. It establishes a data file, `HELP.SCN`, containing text data statements that can be called to appear at strategic program locations as pop-up screens. The `HELP` system is handy information describing how to use the fundamental aspects of the system for new and infrequent users. The text style data statements in `HELP.SCN` are called using a standard module subroutine inserted into each program that uses



help screens. The routine uses data pointers passed to it from the program location referring to the subroutine that picks out the `HELP.SCN` data statements to be displayed. These are the variables `HS` (Help Start location) and `HE` (Help End location).

The Upgrades

This article, second in the *EduSpell* series, builds on the above programs and capabilities started in the first article, expanding the system as necessary to facilitate some powerful, added capabilities derived from the automated update and search capability in *EduSpell*'s dictionary.

Adding the dictionary and programming to support its basic utilization is the thrust of this article. To harness this power, a new program, `PUTWORDS`, has been added. Its purpose is to ensure efficient dictionary organization and revision.

We will move the opening menu from `SPELLER` and add a new menu driver `MAINMENU`, which ultimately becomes a powerful master program for *EduSpell*. If the dictionary is the heart of the system's applicability, the menu driver is the heart of its user friendliness. We'll also add more on-line help to support all the improvements.

The New Features

One of the deadly features of most unsuccessful software is that it is simply too difficult to use. *EduSpell*'s main menu program uses one-touch selection menus that basically drive the system to the appropriate task. All you need to know is what you want to do and the menu routine will drive you there automatically.

When the upgraded system is started up by running `MAINMENU`, it arrives at the main menu, which is similar to the first menu of Version 1, but now has four numerical primary choices in addition to the letters D, to enter the system date (the last date entered is shown by default), and H to ask for the Help screens that tell you what can be done at this screen.

The primary options are either to: add words to the dictionary; make up a test from the dictionary; make up a test using all new words that will also be added to the dictionary; or administer a test.

In the first case, the program jumps to the `SPELLER` program with a flag saved, indicating the choice to add new words to the dictionary. This process is similar to that of inputting words described in the first article. When the keyboard entries are completed, they exist in the array `W$`.

The selected words are then reviewed as a separate group, during which you can delete words, change their sound, or enter up to 50 new ones. They are then saved in a temporary file on disk and execution is transferred to `PUTWORDS`, which sorts them and inserts them into the dictionary as described before.

Option 2, Creating tests from the data files, was a major milestone in the development of *EduSpell*. Through a sequence of complex programming steps, *EduSpell* enables you to select words for your test by either picking words from existing test data files, such as for a review (Case 1), or bracketing any or all of several statistical parameters using the dictionary as an object file (Case 2).

In Case 1, *EduSpell* presents the tests that exist on the disk and permits you to pick which tests to use to select words from. The subsequent selection process is similar to that for tests made up from dictionary words.

In Case 2, several parameters are presented on the screen, such as the prior percentage of times the candidate word was spelled correctly and the difficulty level, to be bracketed with search values. For example, if you wish to seek only words that have given the students trouble, such as all words with less than 70 percent performance by the students, set the high percentage at 70.

The Repeats option offers the opportunity to select words that appear to give the students difficulty from the standpoint of speech synthesis. The selection criteria is how many times the word has been asked to be repeated during formal spelling examinations.

To establish a bracket of difficulty levels, simply select the difficulty bracket and you will be prompted to enter the minimum difficulty level (0 to 9).

The menu asks how many words you want it to retrieve at a time as candidate words — up to 80 words can be brought into memory at a time. (This is not the number of words on the test.) Once searching begins, *EduSpell* retrieves words that fit within the prescribed bracketed requirements. Then you can pick which of the words are to be on the test by selecting each as they appear in groups of ten on the screen.

The parameters can be selected individually or as a set. If no parameters are changed, 100 words are selected without the Auto-Test Maker from all difficulty levels.

With the Auto-Test Maker option, the Number of Words option is the number of words to be on the test (zero to 50). Auto-Test Maker goes completely through the dictionary or candidate spelling tests, depending on whether Case 1 or 2 is in progress, looking for words that fit the selected bracketing requirements. Once the designated number of words are found, the Auto-Test Maker continues through the dictionary, replacing already chosen words at random to ensure the sampling is representative throughout the alphabet.

EduSpell allows you to page up and down through the words to review and select from them to create a test. When you're done, the test is assigned a name and saved.

Building a direct test, Option 3, is also similar to the procedures described in the first article. Up to 50 new words are entered and a test is created, but in addition to the option of administering the test the words are added to the dictionary.

Taking a test, Option 4, again, resembles procedures in the first article. However, in this upgraded version the test administration program has been enhanced with the ability to update the dictionary's statistics for each word based on the results of the test being taken.

The system date can also be entered, which is stored in the first data bin of the `HELP.SCN` data file, and retrieved when necessary.

(You may note that there are actually three bits of data stored in the first 51 byte bin of `HELP.SCN`. One is the name of any test selected to be administered, taking up the first 12 bytes, the second, in the 13th and 14th bytes, is whether the test is to be practice or "real", and the third, in the 15th through 17th bytes, is the system date. This technique makes more data space available on the disk even though bytes 18 through 51 of that data bin are presently wasted. (Each file takes up a minimum of one disk sector or 256 bytes.)

The Help screen options are placed strategically throughout the system to enable you to find out what each major option does. Each time, the same basic Help routine is used to retrieve the Help screen data according to the values of `HS` and `HE` passed to the subroutine.

The Dictionary

Incorporating the dictionary into the system can be done several ways, the simplest of which is to use the upgraded *EduSpell* system, simply entering the words. This is easy to do once you have upgraded the system with this article's suggestions. However, when each word is entered, it is pronounced to allow you to check the sound. Getting the feel of the S/SC takes some time and you can easily spend a lot of time doing this since many of the words, as you know from using *EduSpell* with the S/SC, require intentional misspellings to get a correct synthesis.

To get the system rolling, the program `MAKEDICY` (Listing 5) has been provided to create a small starter dictionary. Although only 22 words, the format can be used to add as many words as you like, but you must be careful of the voice synthesization if you choose to do this. Study the words provided to see what works without incorrect spellings in the synthesization. You can add words up to the limits of the disk size, including all files (several hundred words). (Note that the program currently supports only one disk operation and the dictionary must also fit on the same disk as the program files.

For subscribers to RAINBOW ON TAPE and DISK, this month's edition includes 26 data listings `A.BAS` through `Z.BAS`, as well as a program similar to `MAKEDICY`. These files set up a dictionary of several hundred words at the sixth grade level. The set-up procedure is given in the Up-and-Running sidebar.

Either way, you will be starting out the dictionary with all the entries in the proper alphabetical order for maximum efficiency.

How the Dictionary is Used

The development of `PUTWORDS` was not a simple task. Inserting a new 3-by-5 card into an alphabetical listing sounds pretty easy, however, even the large and expensive spell-checking programs that permit adding words to the dictionary take the slow and easy way out. They actually accomplish this by adding the words into a second file, usually referred to as a personal dictionary file. Opening the second file and checking separate alphabetized listings can impede the speed of these programs.

There actually exists a compromise. Using binary-packed versions of the words permits tremendous speed, but then adding new words into the dictionary without creating a second file means unpacking virtually the entire dictionary (which then probably will not fit in memory), inserting the added word alphabetically, then repacking and saving it. *EduSpell* saves the words in 51-byte segments in random file access format. This permits speed more than fast enough for the application and readily enables adding (or later deleting and editing) words to the dictionary by using digital pointers to find alphabetically sequential words not in numerically sequential file segments. Although using this technique means fewer words compared to the binary packed system, there is little need for more than a few hundred words in a single grade spelling dictionary. Also, when the system is operational, you see that its disk access speed is adequate for its tasks.

At the fundamental level, speed is not essential in using *EduSpell*'s dictionary. Also, when initialized using `MAKEDICY`, the dictionary is actually in alphabetical order as written into the data bins in the dictionary file, `WORDLIST`, for maximum access speed. However, it seems unnecessary to sit waiting while the disk drive crunches away looking through separate files for your added words. This is the case as you develop separate dictionaries a few words at a time. *EduSpell*'s dictionary actually inserts the new words in a digitally logical way, alphabetized accordingly.

Because `PUTWORDS` is essentially a background task, no help screens are incorporated. Even though you never make any decisions once it goes into action and it does its job quite well. It is instructive to examine how the pointing is carried out to permit `PUTWORDS` to insert the words in the correct alphabetical order, even though they are saved in the next sequential sector bin.

The secret to this approach is in how the dictionary is accessed. *EduSpell* uses random-access data storage in the dictionary and each word's data stored with it contains digital pointers to the previous and next alphabetical words. These pointers are in the eighth through eleventh bytes of the eleven data bytes associated with each word. The 48th and 49th bytes point to the previous word, and the 50th and 51st point to the next. These bytes are encoded numerically using the `CHR$()` statement in `PUTWORDS`.

When `PUTWORDS` wants to insert a word into the dictionary, it first searches for the alphabetical point where the word should go. Then it affixes the next pointer of the previous word and the last pointer of the next word to the word to be inserted and alters the pointers of the last and next words to point to the storage location of the newly inserted word. It does this by calculating the values to assign the pointer bytes using the storage location bin number of the new word. It assigns these numbers according to the formula:

$$\text{number} = A + 256 * B$$

where A is the ASCII value of the data in the 48th byte and B that of the 49th (in the case of the pointers to the last word).

For example, if you added "sat" as the 600th word in your dictionary, `PUTWORDS` would first determine what words are before and after it alphabetically in the existing `WORDLIST.DAT` file, possibly "sand" and "soot". Assuming "sand" was stored in the 320th data bin in the file and "soot" the 321st, the pointers for "sat" would be 320 and 321. The 48th and 49th bytes would then be stored as:

$$B = FIX(321/256) = 1$$

$$A = 321 - 256 * B = 65$$

and stored as `CHR$(1)` and `CHR$(65)` in the 48th and 49th positions respectively. Similar calculations result in storing `CHR$(1)` and `CHR$(66)` in the 50th and 51st places to point to "soot" in Location 321.

Of course, `PUTWORDS` must also change the next pointer of "sand" to 600 vice 321 and the last pointer of "soot" to 600 vice 320, to point to the added word between them, vice each other.

Note that the pointers are actually independent of actual alphabetical order and, subsequently, if "slot" is later added as the 625th word, alphabetical access is easily maintained.

This approach permits a large dictionary that is readily accessible and limited in size only by the storage space available on the disk. Speed is maintained through the random access method, even though words to be selected for a spelling test are scattered throughout the dictionary.

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However, some slowdown does occur. Searching various locations throughout the dictionary after you have added a lot of new words will slow down the word selection process to a minor extent. In a future article we will add a utility to reinitialize your dictionary and regain maximum speed whenever this becomes a problem.

Importantly, "aardvark" is the first significant word likely to show up on any sixth grader's spelling agenda in my Webster's Dictionary, and "zoom" is the last. Adding these words to the dictionary enables always knowing the first and last words. This comes in handy with dictionary utilities. (Because of the larger dictionary in the RAINBOW ON TAPE and DISK edition, the word "zymurgy" is used as the last word there.)

Doing the Upgrade Shuffle

The quantum improvement in *Eduspell*'s usefulness, test building procedures and desire to use a modular concept required rewriting some of the Version 1 listings. Every effort was made to keep things simple in the upgrade from Version 1 to Version 2. For subscribers to RAINBOW ON TAPE and DISK, the entire set of new program listings are available, ready to run after performing the dictionary and `SETHELP` setup routines described in the Up-and-Running sidebar. Version 3, in the next article, is virtually completed based upon Version 2. After these changes, the system will be upwardly compatible with follow-up articles.

`SPELLER` required significant revision to incorporate adding words to the dictionary and the routines that select words from the candidate words. In fact, its expansion resulted in the creation of the program, `PUTWORDS`, necessary for staying within BASIC memory limitations. Because these changes are extensive, a complete new listing is provided. This listing is an overlay of the old version and can either be typed in completely or altered appropriately using the upgrading steps outlined in the Up-and-Running sidebar.

The routine for entering new words into the dictionary at lines 500 through 520 in Version 1 was sped up with the replacement lines 499 through 520.

For instance, the Review Words procedure beginning at Line 700 was replaced by the greatly improved.

As a matter of interest to RAINBOW old timers, the routine in lines 3300 through 3384 is a routine from many issues. It is modified here to list only selective data file types on the screen, such as spelling tests. You select one of the displayed files and it saves the name and then carries out its instruction.

Up-and-Running

The steps to upgrade *EduSpell* and the new listings needed are summarized as follows (Note: RAINBOW ON TAPE and DISK users only:Refer directly to Section III.):

I. Upgrade your existing *EduSpell* system as follows:

`ROMRAM` (from Article I): Change Line 12 to `RUN "MAINMENU"`.

`MAINMENU`: Type in Listing 1; save as `"MAINMENU"`.

`SPELLER`: Refer to Listing 2. You can either type in the new listing or make the following changes to your existing `SPELLER` program:

- Line 10: Change the `CLEAR` statement to `CLEAR9000:` as shown in the middle of the line.
- Line 40: Insert `IF Q=1THEN` at the beginning and change the value of `B$` to `01` as shown.
- Add lines 12, 42, 44 and 55.
- Delete lines 100 through 130 and type in lines 100 through 499.
- Line 500: Delete the beginning `GOSUB3110:I=0:` statements.
- Change the name of variable `L$` in lines 540, 550 (twice), and `L$` in Line 560 to `E$`.
- Delete lines 570 through 630 and replace with new line numbers 570 through 630. Note that there is a lot of similarity here, but too many changes to mention individually. These could easily be made to your current file.
- Line 710: Delete `UNLOAD:FOR L=0TO9` and add `L=0`.
- Retype Line 720 as shown in the listing.
- Line 730: Delete the `770` after `THEN` and insert the `PRINT` statement also shown in the listing.
- Line 770: Add `IF Q<2THEN` to the beginning of the line.
- Line 790: Change the `CHR$(95)` statement to `CHR$(94)`. Delete the remainder of the line after the statement `L=L-1:` and add the `IF` statement as shown in the listing.
- Line 800: Change the values of `HS` and `HE` to `24` and `28`, respectively, delete `780` at the end of the line, and add `ELSE SOUND120,2:GOTO780` to the end of the line.
- Add lines 810 through 830.
- Delete Line 920.
- Line 930: Add `Q=1:` to the beginning of the line.
- Delete the existing Line 980 and add lines 972 through 990.
- Change lines 3010 and 3020 to replace `Y$` with `YY$` as shown and add the `ELSE Y$=YY$` statement to the end of Line 3020.
- Type in new lines 3300 through 3384.
- There are several optional changes to the `HELP` subroutine starting at Line 4010. Refer to the article for these.

`PUTWORDS`: Type in Listing 3.

`TAKETEST`:

- Add Line 45:
  `45 Z$=" % %  ##  % %".`
- Delete lines 130 through 180.
- In Line 300, change the value `XB` to be set equal to `2200`.
- Delete lines 370 and 380.
- Change the `GOSUB` statement in Line 490 to read `GOSUB 1430` vice to Line 1420.
- Add Line 615: `615 if IF C>0THEN MID$(W$(3,I),3,1) = CHR$(C).`
- In Line 710, add to the beginning of the line: `MID$(W$(3,I),1,1)=CHR$(1):`.
- In Line 940, replace `FIX(P+.5)` with `INT(P)`.

- Change Line 990 to: `990 GOTO 2000.`
- Type in lines 2000 through 2300 as follows:

```
2000 POKE65495,0 ' *** SORT WORD
S FOR UPDATE
2010 FOR I= 1 TO E-1
2020 FOR J= 1 TO E-1
2030 IF W$(1,J)< W$(1,J+1) THEN2
070
2040 W1$ = W$(1,J):W2$ = W$(2,J)
:W3$ = W$(3,J)
2050 W$(1,J) = W$(1,J+1): W$(2,J
) = W$(2,J+1): W$(3,J) = W$(3,J+
1)
2060 W$(1,J+1) = W1$: W$(2,J+1)-
= W2$: W$(3,J+1) = W3$
2070 NEXT J
2080 NEXT I
2090 POKE65494,0
2100 ' *** UPDATE DIC'Y DATA
2110 OPEN"D",#1,"WORDLIST/DAT",
51
2120 FIELD#1,51 AS B$
2130 FOR I=1 TO E
2140 NL=256* ASC(MID$(W$(1,I),48
,1))+ ASC(MID$(W$(1,I),49,1))
2150 GET#1,NL:BB$=B$
2160 NI=256*ASASC(MID$(BB$,50,1)
) + ASC(MID$(W$(BB$,51,1))
2170 GET#1,NI:BB$=B$
2180 NR=ASC(MID$(BB$,41,1)):NB=A
SC(MID$(BB$,42,1)):RP=ASC(MID$(B
B$,43,1))
2190 RN = ASC(MID$(W$(3,I),1,1))
: BN=ASC(MID$(W$(3,I),2,1)):PR=A
SC(MID$(W$(3,I),3,1))
2200 MID$(BB$,4541,1)=CHR$(NR+RN
): MID$(BB$,42,1)=CHR$(NB+BN):MI
D$(BB$,43,1)=CHR$(RP+PR)
2210 LSET B$=BB$:PUT#1,NI
2220 NEXT I
2300 UNLOAD:GOSUB1000: PRINT@32*
8+6,"TRANSFERRING TO mainmenu ";
:RUN"MAINMENU/BAS"
```

`SETHELP`: Type in Listing 4. Save the program as `SETHELP` and make backup copies. Run `SETHELP` to create the new Help file and copy this file to your new *EduSpell* System Disk 2.

II. Create the dictionary as follows:

- Type in Listing 5 and save as `MAKEDICY.BAS`.
- Make sure that you have made backup copies and used a blank, formatted disk, and run `MAKEDICY`. This results in initializing a small dictionary of 22 words to get you started.
- Make a backup copy of your completed dictionary disk and set your original aside.
- Copy the dictionary file `WORDLIST.DAT` onto the disk containing the upgraded *EduSpell* system files.
- Make backup copies and Version 2 of *EduSpell* is ready — Boot up!

III. RAINBOW ON TAPE and DISK users only:

- Start out with a blank formatted disk and save each of the files named `A.BAS` through `Z.BAS` and `MAKEDICY.BAS` onto it. Make sure to save `MAKEDICY` in ASCII format by entering `SAVE"MAKEDICY",A`. Make at least one backup copy.
- With at least one backup disk stashed safely away, run `A.BAS` and watch as your `WORDLIST.DAT` dictionary is created.
- When this is completed, the dictionary will exist in the file `WORDLIST.DAT` and `MAKEDICY` and all the data files will be erased. ☐

There are several minor improvements in the `HELP` subroutine starting at Line 4000 in `SPELLER`, in addition to the changes in the insert (these are optional changes):

(1) Old Line 4030 is moved to 4055, a slightly different order of execution for speedup of the scrolling

(2) The `IF` statement can be added at the end of old Line 4050, but before the remark, as follows:

```
:IF XH=1 THEN RETURN
```

(3) There is a minor change of Print Location 488 to 487 in Line 4080.

(4) Lines 4110 through 4140 can be deleted and replace with line numbers 4105 and 4110.

(5) Old Line 4110 is replaced by 4095.

Because of the big changes to `SPELLER`, `SETHELP`'s data is totally different from Version 1. Several screens are added. `SETHELP` is then run to create the new `HELP.SCN` file. After running `SETHELP`, save the program in your archives and put `HELP.SCN` on *EduSpell* Version 2 program disk.

For RAINBOW ON TAPE and DISK users, the program `MAKEDICY` processes the 26 data listings, `A.BAS` to `Z.BAS`, and initializes `WORDLIST.DAT`. When these dictionary initialization programs are run, they destroy themselves from the disk as they are run in order to make room for the resultant dictionary file. To start the initialization process, the first data program, `A.BAS` is executed as described in the Up-and-Running sidebar. `MAKEDICY` is subsequently merged into each of the 26 data files and they automatically execute in a chain by tracking and incrementing the variable string `NX$`. Because it is merged, it must be saved in ASCII format. Be sure all copies of `MAKEDICY` are saved in ASCII format by adding `,A` at the end of the command string `SAVE "MAKEDICY/BAS ",A`.

For others, enter Listing 5 and save it. Make backup copies and then run the program as `MAKEDICY`. The version in Listing 5 will not self-destruct.

The data lines of these listings consist of the proper spelling of each word, its speech synthesis, and a nominal level of difficulty. (Feel free to change it.) Where there is no second version of the word, it means the synthesized version is exactly the same as the actual spelling. In that case, `MAKEDICY` duplicates the actual word into the entry for the synthesized version. This should ease your typing burden a bit, but the main advantage is that you can see where synthesis matters by looking at these data listings. I recommend that you keep these listings handy to see those cases where the spellings differ. It will help you when entering new words to see what works.

These data entry initialization procedures were chosen because ultimately the dictionary data file can be much too large to fit into memory. Therefore, several small files and an implementing program permit you to create a file that otherwise would be impossible. Also, using this method allows use of a word processor to make life simpler, especially if you have a spell checker (obviously, you need to be careful with dictionary spelling).

`MAKEDICY` and the data files should be copied onto separate disks and run separately. Be certain that you have a backup before running the initialization process. Make at least two or three backups of each of the disks before starting this procedure.

In this article, the changes to the test administration program, `TAKETEST`, are few. The changes are minor with the exception of the routine now in lines 2000 through 2220 (refer to the Up-and-Running sidebar). This is a valuable enhancement as you use the program throughout the school year. The routine enables updating historical data for each individual word in the dictionary that appears on a given test. This information is later used during word searches to bracket words of interest.

The number of times the word was given is incremented, the number of times it was spelled correctly when asked is updated and the number of times the students have asked to have the word repeated are all updated in the dictionary content of each word. The words are first sorted alphabetically to enhance disk access time (lines 2010 through 2080).

Note that lines 2000 and 2090 utilize the speed-up and slow-down pokes for older CoCos. If your machine doesn't require them, make Line 2000 a blank comment line (`2000 '`) and omit Line 2090.

After all is done and the dictionary is updated, Line 2300 returns you to the main menu program.

Summary of *EduSpell* Version 2

As *EduSpell* exists after this upgrade, you will have an excellent educational application that is capable of:

- building and administering oral spelling tests.
- creating tests by selecting and using a random search procedure followed by selecting the test words from the candidate words based, possibly based on the historical data associated with each word.
- creating tests by bracketing any of several named parameters and having your CoCo make up a test automatically.
- naming and saving tests while online.
- adding as many words to the dictionary as the disk will hold.
- simple creation of new dictionaries by plugging in new words into Listing 5 to create a new `WORDLIST.DAT` file. (If you do this, you should make the first word early in the dictionary, such as "aardvark" and the second word late, such as "zoom" to ensure `PUTWORDS` always rounds its corner properly when adding new words. Be sure to position the word as the last one in the dictionary in Line 240 of Listing 5. This causes the seeking code for the next word to circle back to the start of the dictionary.)

Hints of Things to Come

The next articles in this series will add significant dictionary editing abilities and other goodies to enhance new word entry significantly. Although *EduSpell* avoids bells and whistles, we will add a utility to permit using the dictionary for crossword puzzle types of searches. Part 4 will add printing features, teacher administrative utilities and student data files that will also be automatically updated after the student takes a test.

This is a major upgrade to *EduSpell*. If you have problems getting Version 2 operational, I will be glad to assist via Delphi (user name SDJ9060), but due to my frequent extended absences, I cannot promise a prompt time frame for response.

(Questions or comments concerning this article may be addressed to the author in care of THE RAINBOW *at the Falsoft Building, P.O. Box 385, Prospect, KY 40059. Please include an SASE when requesting a reply.)* ❑

For your convenience, the modified version of the EduSpell system (all programs) are included on this month's RAINBOW ON TAPE *and* DISK. *Although they are not listed here,* `ROMRAM` *and* `TAKETEST` *(from Part 1) and the dictionary files,* `A.BAS` *through* `Z.BAS`, *are also included on this month's edition of* RAINBOW ON TAPE *and* DISK. *Tape subscribers must copy the files to disk before execution.*

115	132	6360	54
3110	221	7000	68
6042	74	END	209
6250	64		

Listing 1: `MAINMENU`

```
0 ' COPYRIGHT 1989  FALSOFT,INC
1 PMODE0:CLEAR5000:CLS5
2 Z9=1    ' Z9 IS A FLAG
3 Z8=0    ' Z8 IS A FLAG
4 ' Z8=0 -> INITIALIZE DATE /
    Z8=1 -> STORING DATE    /
    Z8=2 -> STORING A STRING WI
TH THE NAME OF THE TEST TO BE TA
KEN  -  OR  -  NAMES OF FILES TO
 BE PRINTED
11 DIM D(4):D(1)=FREE(0) 'IF USI
NG > 1 DRIVE THEN ADD D(2)=FREE(
1), ETC.
12 ZB$="<d>ATE  <h>ELP"
14 GOTO6370
100 GOSUB9000:PRINT@32*3+9,"E D
U S P E L L";:PRINT@32*6+7,"sele
ct option:";:PRINT@32*8+3,"<1> -
 put words into dic'y";:PRINT@32
*9+3,"<2> - build test from file
s";:PRINT@32*10+3,"<3> - build d
irect test";:PRINT@32*11+3,"<4>
- take a test";
102 PRINT@32*15+10,ZB$;
105 PRINT@5,USING"system date: #
#/##/##";YR,MO,DA;
115 K=0:GOSUB 8000:Z=VAL(Y$)
116 IF Y$="D"THEN3000 'CHANGE SY
STEM DATE
117 IF Y$="H"THEN HS=1:HE=5:GOSU
B18000:GOTO100 'CALL HELP SCREEN
S
120 ON Z GOTO 130,130,130,6000:G
OTO100
130 GOSUB9000:PRINT@32*8+6,"shif
```

```
ting to 'SPELLER'";:GOSUB1500:RU
N"SPELLER"
1500 OPEN"D",#1,"HELP/SCN",17
1510 FIELD #1,12AS A$,2AS B$
1520 Z$=STR$(Z)
1530 LSET A$="WORDLIST/DAT":LSET
 B$=RIGHT$(Z$,2)
1540 PUT #1,1:CLOSE#1:RETURN
3000 'CHANGE DATE /R
3010 GOSUB9000:Z8=2:PRINT@32*11+
15,"##/##/##";:PRINT@32*12+15,"y
r mo da";:PRINT@32*11,"";:LINEIN
PUT"SYSTEM DATE:   ";C$
3019 '*** CHECK FORMAT
3020 S1=INSTR(C$,"/"):S2=INSTR(4
,C$,"/"):IF S1=3AND S2=6THEN3100
3030 PRINT@32=14+6,"wrong format
 ....";:SOUND120,3:GOSUB7000:GOT
O3010
3100 '*** IF FORMAT OK THEN ...
3110 YR=VAL(MID$(C$,1,2)):MO=VAL
(MID$(C$,4,2)):DA=VAL(MID$(C$,7,
2))
3119 '*** STORE DATE ON DISK
3120 Z8=2:GOTO6370
5000 CLS4:PRINT@32*7+8,"TRANSFER
RING TO";:PRINT@32*9+12,"editlis
t";:RUN"EDITLIST"
6000 'S/R TO LIST FILES - ADOPTE
D FROM rainbow
6005 CLS4:PRINT@32*7+11,"ONE MOM
ENT";:PRINT@32*9+13,"PLEASE";
6010 DIM T$(11,7),N$(68),TP(68)
6020 N=1:DR=0:DN$="0"
6026 F1$="TST"
6030 FORX=3TO11:DSKI$DR,17,X,A$,
B$:C$=A$+LEFT$(B$,127):FORI=0TO7
6040 T$(X,I)=MID$(C$,I*32+1,32):
C1=ASC(T$(X,I)):IF C1=255THEN607
0ELSE IF C1=0THEN6060
6041 IF LEFT$(T$(X,I),8)="DOS BO
OT"THEN6060 ' CAN'T PRINT /BIN F
ILES
6042 IF MID$(T$(X,I),9,3)<>F1$ T
HEN6060ELSE N$(N)=LEFT$(T$(X,I),
12):TP(N)=ASC(MID$(T$(X,I),12,1)
)
6050 N=N+1:IF N=69THEN6070
6060 NEXTI,X
6070 N=N-1:FORX=1TON:N$(X)=LEFT$
(N$(X),8)+"."+MID$(N$(X),9,3):NE
XT
6080 CLS6:PRINT@32*15+14,"<f>";:
PRINT@0,"";
6090 IFN<=30THENPP=1:N1=N
6100 IFN>30THENPP=2:N1=30
6110 IFN>60THENPP=3:N1=30
6120 FORX=1TON1:PRINT" "N$(X),:N
EXTX
6130 IFPP=2ORPP=3THENPRINT@480,"
PRESS <M> FOR MORE...";
6140 L$=">":R$="<":P=0:Y=1
6150 PRINT@P,L$;:PRINT@P+13,R$;
6160 FORX=338TO345:POKEX,255:NEX
TX
6170 IFPEEK(338)=191THEN6360
6180 IFPEEK(339)=191THENCLEAR:GO
TO6010
6190 IFPEEK(341)=247THEN6320
6200 IFPEEK(342)=247THEN6330
6210 IFPEEK(343)=247THEN6340
6220 IFPEEK(344)=247THEN6350
6230 IFPEEK(344)=254THEN6260
6240 IFPEEK(343)=253THEN6270
6250 GOTO6170
6260 PRINT@32*13+2,USING"## FREE
 GRANULES ON DRIVE #";FREE(DR),D
R;:GOSUB7000:GOTO6160
6270 IFPP=2ANDY=1THENCLS:FORX=31
TON:PRINT" "N$(X),:NEXT:PRINT@48
0,"PRESS <M> FOR MORE...";:Y=2:P
=0:N1=N-30:GOTO6150
6280 IFPP=2ANDY=2THENY=1:P=0:N1=
30:GOTO6080
6290 IFPP=3ANDY=1THENCLS:FORX=31
TO61:PRINT" "N$(X),:NEXT:PRINT@4
80,"PRESS <M> FOR MORE...";:Y=2:
P=0:N1=N-59:GOTO6150
6300 IFPP=3ANDY=2THENCLS:FORX=62
TON:PRINT" "N$(X),:NEXT:PRINT@48
0,"PRESS <M> FOR MORE...";:Y=3:P
=0:N1=N-61:GOTO6150
6310 IFPP=3ANDY=3THENY=1:P=0:N1=
```

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```
30:GOTO6080
6320 IFP<17THEN6150ELSEP=P-32:PR
INT@P+32," ";:PRINT@P+45," ";:GO
TO6150
6330 IF P/16=>(N1-2)THEN6160ELSE
P=P+32:PRINT@P-32," ";:PRINT@P-1
9," ";:GOTO6150
6340 P=P-16:IFP<0THENP=0:GOTO615
0ELSEPRINT@P+16," ";:PRINT@P+29,
" ";:GOTO6150
6350 IF P/16=>(N1-1)THEN6160ELSE
P=P+16:PRINT@P-16," ";:PRINT@P-3
," ";:GOTO6150
6360 F=P/16+(Y-1)*30+1:F$=N$(F)+
":"+DN$:TP=TP(F)
6365 Z8=1
6370 OPEN"D",#1,"HELP/SCN",17 'S
TORE NAME OF TEST FILE TO RUN
6380 FIELD #1,12AS A$,2AS B$,3AS
 C$
6381 IF Z8=0 AND Z9=1THEN6388ELS
E IF Z8=2THEN6395ELSE F1$=MID$(F
$,10,3) ' GET DATE IF INITIAL EL
SE PUT NEW DATE WILL PUT NAME OF
 TEST TO TAKE
6383 BB$=CHR$(0)+CHR$(0):GOTO 63
90
6388 GET#1,1:B=VAL(B$):GOSUB1000
0:IF B=9THEN CLOSE#1:Z=6:GOTO600
0ELSE Z9=0:LSET B$="11":PUT#1,1:
CLOSE#1:GOTO100 '*** NOTE: B-0 O
N STARTUP
6390 LSET A$=F$:LSET B$=BB$:GOTO
6400
6395 LSET C$=CHR$(YR)+CHR$(MO)+C
HR$(DA) ' DATE OF TEST
6400 PUT #1,1
6410 CLOSE#1
6411 IF Z8=2THEN Z8=0:GOTO100
6420 GOSUB9000:PRINT@32*8+4,"tra
nsferring to TAKETEST"
6430 RUN"TAKETEST/BAS"
7000 FOR X9=1TO600:NEXT X9:RETUR
N  ' PROGRAMMED DELAY LOOP
8000 YY$=INKEY$ ' ROUTINE TO MIN
IMIZE INKEY$ ERRORS
8010 YY$=INKEY$:IF YY$=""THEN801
0ELSE Y$=YY$:YY$=INKEY$:RETURN
9000 CLS:SOUND200,1:RETURN
10000 'GET DATE S/R
10010 YR=ASC(MID$(C$,1,1)):MO=AS
C(MID$(C$,2,1)):DA=ASC(MID$(C$,3
,1)):RETURN
18000 XH=0:OPEN"D",#2,"HELP/SCN"
,130
18010 FIELD#2,130 AS H$
18020 CLS8:PRINT@43,"H  E  L  P"
;:IF XH=1THEN RETURN
18030 FOR H=6TO13:PRINT@32*H+8,S
TRING$(16," ");:NEXT H
18040 FOR H=HS TO HE:GET#2,H+1
18050 H1$=MID$(H$,1,2):PRINT@32*
3+14,USING"<%%>";H1$;
18060 FOR H1=1TO8:PRINT@32*(4+H1
)+8,MID$(H$,16*(H1-1)+3,16);:NEX
T H1
18070 PRINT@32*15+7,"<W>ait   <R
>eturn>";
18080 Y$=INKEY$:FOR X9=1TO300:Y$
=INKEY$:IF Y$=""THEN NEXT X9
18090 IF Y$="W"THENPRINT@32*15+2
,STRING$(28," ");:PRINT@32*15+3,
"press any key to continue";:GOS
UB8000:GOTO18110
18100 IF Y$="R"THEN CLOSE#2:Z=0:
RETURN
18110 XH=1:GOSUB18020:XH=0:NEXT
H:GOTO18020
```

55	239	740	238
220	193	970	176
310	125	2080	39
326	150	3312	169
342	94	3354	182
360	138	3382	189
372	161	END	16
560	69		

Listing 2: SPELLER

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 PCLEAR1:CLEAR9000:XB=500
12 H1$="":DN$="":F1$="":F$="":YY
$="":Y$="":X9=0:Q=0:H=0:H1=0:HT=
0:XH=0:HS=0:HE=0:ZZ=0:Z1=0:Z2=0:
N1=0:N=0:NN=0:NT=0:K=0:L=0:M=0:P
=0:PP=0:J=0:JJ=0:E=0:TG=0:RB=0:I
I=0:X=0:Y=0:TT=0:DR=0:L1=0:JK=0
20 POKE65494,0:OPEN"D",#1,"HELP/
SCN",17
30 FIELD#1,12AS A$,2AS B$,3AS C$
40 IF Q=1THEN LSET A$=F$:LSET B$
="01":LSET C$=DA$:PUT#1,1:CLOSE#
1:RETURN ' *** STORE NAME OF FIL
E
42 GET#1,1:Z=VAL(B$) ' *** GET D
ATE AND ACTION CODE
44 DA$=C$:YR=ASC(MID$(C$,1,1)):M
O=ASC(MID$(C$,2,1)):DA=ASC(MID$(
C$,3,1)):CLOSE#1
50 DIM W$(3,50),A$(3,80),S$(80),
B$(6)
55 DIM T$(11,7),D$(68),N$(68),F$
(68)
60 Z1$="        ##  %
      %":Z4$=STRING$(32," ")
70 Z$="### % % #  %
      %"
100 RP=0:RP$="OFF":AG=0:AG$="OFF
```

```
“:DD=0:DL=0:DH=10:PT=100:PC=0:NT
=20:IF Q=1THEN200
110 ON Z GOTO499,120,499:Z=2:PRI
NT@265,"error detected";:GOTO980
120 POKE65494,0:OPEN"D",#1,"WORD
LIST/DAT",51
130 FIELD#1,20AS B$(1),20AS B$(2
),11AS B$(3)
140 E=LOF(1)
150 FOR J=1TO 80:S$(J)="":NEXT J
200 GOSUB3110:PRINT@131,"select
words by:";:PRINT@229,"<1> PARAM
ETER SEARCH";:PRINT@293,"<2> BUI
LD A REVIEW TEST";:GOSUB3050:GOS
UB3010:IF Y$="H"THEN HS=6:HE=8:G
OSUB4010:GOTO200
210 IF Y$=CHR$(12)THEN IF N>0THE
N340ELSE PRINT@453,"sure?";:GOSU
B3010:IF Y$="Y"THEN RUN"MAINMENU
“ELSE200
220 GOSUB3110:ZZ=VAL(Y$)
230 ON ZZ GOTO 300,3302:GOTO 200
300 SOUND200,1:PRINT@6,"search p
arameter:";:PRINT@135,USING"<1>
score <= ###%";PT:PRINT@199,"<2>
 difficulty";:PRINT@263,"<3> rep
eats: “;RP$;:PRINT@327,USING"<4>
 NO. WORDS = ###";NT:PRINT@391,"
<5> auto-test maker: “;AG$;
```

```
302 GOSUB3060:GOSUB3010:IF Y$="H
“THEN HS=15:HE=22:GOSUB4010:GOSU
B3110:GOTO300ELSE IF Y$=CHR$(12)
THEN Q=1:GOTO100ELSE IF Y$="S"TH
EN I=0:GOTO314ELSE ZZ=VAL(Y$):ON
 ZZ GOTO304,306,308,310,312:GOTO
300
304 PRINT@148,"-%";:PRINT@148,
“ ";:LINE INPUT"";PT$:PT=VAL(PT$
):SOUND180,1:IF PT=100THEN PC=0:
GOTO300ELSE PC=1:GOTO300
306 DD=1:PRINT@224,Z4$;:PRINT@23
5,"minimum: “;:PRINT@243,"";:GOS
UB3010:SOUND180,1:PRINT Y$;:DL=V
AL(Y$):PRINT@245,"maximum: “;:PR
INT@253,"";:GOSUB3010:PRINT Y$;:
DH=VAL(Y$):SOUND180,1:GOTO300
308 IF RP=0THEN RP=1:RP$=" ON":S
OUND220,1:GOTO300ELSE RP=0:RP$="
OFF":SOUND180,1:GOTO300
310 PRINT@343,"  ";:PRINT@343,""
;:LINEINPUT"";N$:NT=VAL(N$):IF N
T>80THEN SOUND120,2:NT=80:PRINT
Z4$;:PRINT@352,"MAXIMUM NO. IS 8
0";:XB=800:GOSUB3210:PRINT@343,Z
4$;:GOTO300ELSE SOUND180,1:GOTO3
00
312 IF AG=0THEN AG=1:AG$=" ON":S
OUND220,1:GOTO300ELSE AG=0:AG$="
```

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```
OFF":SOUND180,1:GOTO300
314 TN=N+NT:IF Q=3THEN RETURN
316 PRINT@0,STRING$(96,CHR$(239)
);:PRINT@41,"- SEARCHING -";
320 K=K+1:IF E<K THEN336ELSE POK
E65494,0:GET#1,K:POKE65495,0
322 IF DD=0THEN324ELSE D=ASC(MID
$(B$(3),4,1)):IF DH>=D AND DL<=D
 THEN324ELSE320
324 TG=ASC(MID$(B$(3),2,1)):IF Q
<3 OR RP=0THEN326ELSE RB=ASC(MID
$(B$(3),3,1)):IF RB>=TG^.5-1 AND
 Q<3 THEN326ELSE IF Q=3 AND RB>0
 THEN 326ELSE320
326 IF PC=0 OR Q=3THEN328ELSE TC
=ASC(MID$(B$(3),1,1)):IF TC/(TG-
.01)<=(PT+.02)/100THEN328ELSE320
328 N=N+1:I=I+1:J=N:IF N<=TN THE
N330ELSE IF RND(E)<E/25THEN N=N-
1:J=RND(NT)ELSE N=N-1:I=I-1:GOTO
320
330 A$(1,J)=B$(1):A$(2,J)=B$(2):
A$(3,J)=B$(3)
332 IF I=NT AND AG<>1 THEN336
334 IF I>=NT THEN I=0:GOTO320ELS
E320
336 IF Q=3THEN RETURN
338 IF AG=1 THEN FOR I=1TO NT:FO
R J=1TO3:W$(J,I)=A$(J,I):NEXT J,
I:NN=NT:GOTO710
340 L=L-1
342 GOSUB3110:PRINT" J   N <#>
W O R D S";:PRINT@28,USING"##";N
N:PRINT STRING$(32,"-");:IF L<-1
THEN L=-1
344 Z2=0:L=L+1:IF L>=13 THEN Z=3
:GOTO110
346 FOR I=1 TO 10
348 J=10*L+I
349 IF (J>TN AND Q<2)OR(Q>1ANDJ>
TN) THEN PRINT@357,"end of file"
;:GOTO356
350 II=I:IF I=10THEN II=0
352 PRINT@32*(I+1),USING Z$;J,S$
(J),II,A$(1,J)
354 NEXT I
356 Z2=0:IF Q<2THEN PRINT@484,"<
g> <r> <^> <DN> <#> <h>"; ELSE P
RINT@486,"<r> <^> <DN> <#> <h>";
358 PRINT@448,"select words for
the test:";:GOSUB3010
359 IF Y$="H"THEN HS=9:HE=13:GOS
UB4010:GOSUB3110:L=L-1:GOTO342
360 IF Y$="R"THEN710ELSE IF Y$="
G"AND Q<1THEN361ELSE366
361 IF N>80-NT+1THEN362ELSE365
362 GOSUB3110:PRINT@130,"TOO MAN
Y WORDS IN MEMORY ..";:PRINT@192
,"NEED TO:";:PRINT@231," <clear>
 MEMORY";:PRINT@264,"<r>eview &
CANCEL GET";:PRINT@324," OR <u>S
E SELECTED WORDS";:PRINT@366,"&
```

```
CLEAR OTHERS";:GOSUB3010
363 IF Y$="R"THEN710 ELSEIF Y$=C
HR$(12)THEN 365 ELSEIF Y$<>"U"TH
EN SOUND120,1:GOTO363 ELSE PRINT
@422,":: ok :: one moment ::";:Z
Z=TT:FOR J=1 TO TN:IF S$(J)="->
"THEN ZZ=ZZ+1:W$(1,ZZ)=A$(1,J):W
$(2,ZZ)=A$(2,J):W$(3,ZZ)=A$(3,J)
:S$(J)=""
364 A$(1,J)="":A$(2,J)="":A$(3,J
)="":NEXT J:N=0:TT=ZZ:L=0
365 I=0:GOSUB3110:GOTO314
366 IF Y$=CHR$(94)THEN L=L-2:GOT
O342ELSE IF Y$=CHR$(10)THEN342
368 IF Y$=CHR$(13)THEN370ELSE372
370 PRINT@448,Z4$;:GOTO358
372 IF ASC(Y$)>47 AND ASC(Y$)<58
 THEN Y=VAL(Y$)ELSE SOUND 120,2:
GOTO358
373 IF Y=0 THEN Y=10
374 J=10*L+Y:IF S$(J)=""THEN NN=
NN+1:IF NN>50THEN399ELSEPRINT@28
,USING"##";NN:W$(1,NN)=A$(1,J):W
$(2,NN)=A$(2,J):W$(3,NN)=A$(3,J)
:S$(J)="->"ELSE SOUND100,2:GOTO
358
376 PRINT@32*(J-10*L+1)+4,"->";
:GOTO370
399 GOSUB3110:PRINT@100,"OBTAINE
D 50 WORDS";:XB=1200:GOSUB3210
499 I=0
500 A$="ENTER THE WORD":GOSUB202
0:A$="THEN SLASH":GOSUB2010:A$="
THEN THE LEVVEL OF DIFFICULTY":G
OSUB2010:X9=1000:GOSUB3210:A$="A
S FOLLOWS":GOSUB2010
510 GOSUB3110:PRINT"enter: WORD/
'LEVEL'";:GOSUB3210
520 I=I+1:IF I>50THEN I=50:GOSUB
3110:A$="THAT WAS FIFTY":PRINT@2
64,A$;:GOSUB2020:Y$="S":GOTO600
530 GOSUB3110:LINE INPUT"enter w
ord: ";D$:IF D$=""THEN530ELSE FO
R D=1 TO LEN(D$):IF MID$(D$,D,1)
="/"THEN 540 ELSE NEXT D
540 E$=MID$(D$,D+1):W$(1,I)=LEFT
$(D$,D-1):W$(2,I)=W$(1,I):A$=W$(
2,I):XB=40*LEN(D$):GOSUB2020
550 IF LEN(E$)<1THEN PRINT@37,"l
evel: ";:LINEINPUT"";E$
560 W$(3,I)=STRING$(11,CHR$(0)):
MID$(W$(3,I),4,1)=CHR$(VAL(E$))
570 IF Z1=0THEN PRINT W$(1,I);"
=":PRINT"       ";W$(2,I); ELSE
 IF Z1=2THEN PRINT W$$(1,I);"=":
PRINT"       ";W$(2,I);
580 PRINT@130,"<ENTER> -> 'OK'";
:PRINT@162,"<CLEAR> -> 'delete w
ord'";:PRINT@194,"< BAR > -> 'ch
ange sound'";:IF CD=1THEN590ELSE
 PRINT@226,"<  S  > -> 'OK & sav
e to disk'";
```

```
590 GOSUB3010:IF Y$=CHR$(12)THEN
530
600 IF Y$<>"S"THEN610ELSE NN=I:F
OR I=1TO NN:MID$(W$(3,I),5,3)=DA
$:NEXT I:IF Z=1THEN F$="TEMP/WRD
“:GOTO710ELSE710
610 IF Y$=CHR$(32)THEN630
620 IF Y$=CHR$(13)AND CD=1THEN R
ETURN
625 IF Y$=CHR$(13)THEN520ELSE590
630 PRINT@320,Z4$;Z4$;Z4$;:PRINT
@320,"";:LINE INPUT”new sound: “
;A$:IF A$=""THEN630ELSE W$(2,I)=
A$:GOSUB2020:GOTO560
710 V=0:Z2=1:L=0
720 A$=" “:GOSUB2020:GOSUB3110:P
RINT”review “;:IF Z=1THEN PRINT”
words”;ELSE PRINT”test words”;
730 FOR P=1 TO 10:I=10*L+P:IF I>
NN THEN PRINT@421,”end of file”;
:GOTO770
740 PRINT@32*(P+2),USING” ### %
                      %”;I,W$(1,I)
750 IF V=1THEN A$=W$(2,I):GOSUB2
010:XB=300:GOSUB3210
760 NEXT P
770 IF Q<2THEN PRINT@484,”<e/d/s
/c/v> <UP> <DN> <h>”;
780 GOSUB3010:IF Y$="D"THEN B$=”
DELETE”:GOSUB1010:GOTO720ELSE IF
 Y$=”V”THEN V=ABS(FIX(V/2-1)):GO
TO730
790 IF Y$="S"THEN910ELSE IF Y$=C
HR$(94)THEN L=L-1:IF L=-1THEN L=
0:GOTO720ELSE720
792 IFY$=”C”THEN GOSUB810:GOTO72
0 ELSE IF Y$=CHR$(10)THEN L=L+1:
GOTO720
794 IF Y$=”E”THEN N=0:TT=NN:L=0:
GOSUB3110:IF Z<>1THEN314ELSE510
800 IF Y$="H"THEN HS=24:HE=28:GO
SUB4010:GOTO720ELSE SOUND120,2:G
OTO780
810 PRINT@416,"";:LINE INPUT”ent
er no. to change: “;I$:I=VAL(I$)
820 IF Z1=2THEN I=10*L+I:A$=A$(2
,I)ELSE A$=W$(2,I)
830 GOSUB2020:CD=1:GOSUB3110:GOS
UB570:CD=0:RETURN
910 IF Z=1THEN930ELSE GOSUB3110:
PRINT@270,”———/TST”;:PRINT@
311,”(assumed)”;:PRINT@256,””;:L
INE INPUT”name of test: “;F$:F$=
F$+”/TST”
930 Q=1:GOSUB20:OPEN”D”,#1,F$,51
940 FIELD#1,20 AS A$,20 AS B$,11
 AS C$
950 FOR I=1TO NN
960 LSET A$=W$(1,I):LSET B$=W$(2
,I):LSET C$=W$(3,I)
970 PUT#1,I:NEXT I:CLOSE#1
980 IF Z=2THEN F$=”MAINMENU”ELSE
 F$=”PUTWORDS”:GOSUB3210
990 CLS4:PRINT@232,”TRANSFERRING
 TO”;:PRINT@300,F$;:IF Z=2THEN R
UN”MAINMENU”ELSE RUN”PUTWORDS”
1010 PRINT@479,Z4$;:A$=”ENTER NU
MBER TO “+B$:XB=50*LEN(A$):GOSUB
2020:PRINT@480,A$;”: “;:GOSUB301
0
1020 IF X8=1THEN I=VAL(Y$)+10*L:
RETURN
1030 IF ASC(Y$)>57OR ASC(Y$)<48T
HEN RETURN
1040 NN=NN-1:Y=VAL(Y$):IF Y=0THE
N Y=10
1050 Y=10*L+Y:FOR I=Y TO NN:FOR
P=1TO3:W$(P,I)=W$(P,I+1):NEXT P,
I:RETURN
2010 XB=40*LEN(A$)
2020 X=&HFF00:Y=&HFF7E:POKE X+1,
52:POKE X+3,63:POKE X+35,60:POKE
65407,34
2030 FOR M=1 TO LEN(A$)
2040 IF PEEK(Y)AND128=0THEN2040
2050 POKE Y,ASC(MID$(A$,M,1))
2060 NEXT M2070 IF
PEEK(Y)AND128=0THEN2070
2080 POKE Y,13:GOSUB3210:POKE654
07,51:RETURN
```

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```
3010 YY$=INKEY$
3020 YY$=INKEY$:IF YY$=””THEN302
0 ELSE Y$=YY$
3030 IF Y$=CHR$(94)AND Z2=1THEN
GOSUB2020
3040 RETURN
3050 PRINT@490,”<clear>   <h>”;:
RETURN
3060 PRINT@485,”<clear>  <s>TART
 <h>”;:RETURN
3110 CLS:SOUND200,1:RETURN
3210 FOR X9=1TO XB:NEXT X9:XB=50
0:RETURN
3302 DR=0:DN$=”0”:L1=1:F1$=”TST”
:JK=0:M=0:J=0:GOSUB3110
3304 CLS4:PRINT@235,”ONE MOMENT”
;:PRINT@301,”PLEASE”;
3306 FOR X=3TO11:DSKI$DR,17,X,A$
,B$:C$=A$+LEFT$(B$,127):FOR I=0T
O7
3308 T$(X,I)=MID$(C$,I*32+1,32):
C1=ASC(T$(X,I)):IF C1=255THEN331
4ELSE IF C1=0THEN3312
3310 IF MID$(T$(X,I),9,3)<>F1$ T
HEN3312ELSE M=M+1:N$(M)=LEFT$(T$
(X,I),8)+”/”+MID$(T$(X,I),9,3)
3312 NEXT I,X
3314 CLS6:PRINT@454,” <enter> TO
 SELECT   “;:PRINT@486,” <clear>
 TO CONTINUE “;:PRINT@2,”indicat
e tests: (*————*)”;:PRINT@32
,””;
3316 IF M<=30THENPP=1:N1=M
3318 IF M>30THENPP=2:N1=30
3320 IF M>60THENPP=3:N1=30
3322 FOR X=L1 TO N1:PRINT”  “N$(
X),:NEXT X
3324 IFPP=2ORPP=3THENPRINT@480,”
PRESS <M> FOR MORE...”;
3326 L$=”>”:R$=”<“:P=32:Y=1
3328 PRINT@P,L$;:PRINT@P+15,R$;
3330 FORX=338TO345:POKEX,255:NEX
TX
3332 IF PEEK(338)=191THEN3366
3334 IFPEEK(339)=191THEN3368
3336 IFPEEK(341)=247THEN3358
3338 IFPEEK(342)=247THEN3360
3340 IFPEEK(343)=247THEN3362
3342 IFPEEK(344)=247THEN3364
3344 IFPEEK(343)=253THEN3348
3346 GOTO3332
3348 IFPP=2ANDY=1THENCLS:FORX=31
TO M:PRINT”  “N$(X),:NEXT:PRINT@
480,”PRESS <M> FOR MORE...”;:Y=2
:P=32:N1=M-30:GOTO3328
3350 IFPP=2ANDY=2THENY=1:P=32:N1
=30:GOTO3314
3352 IFPP=3ANDY=1THENCLS:L1=31:F
ORX=L1TO61:PRINT”  “N$(X),:NEXT:
PRINT@480,”PRESS <M> FOR MORE...
“;:Y=2:P=32:N1=N-59:GOTO3328
3354 IFPP=3ANDY=2THENCLS:L1=64:F
ORX=L1TON:PRINT”  “N$(X),:NEXT:P
RINT@480,”PRESS <M> FOR MORE...”
;:Y=3:P=32:N1=N-61:GOTO3328
3356 IFPP=3ANDY=3THENY=1:P=32:L1
=1:N1=30:GOTO3314
3358 IFP<49THEN3328ELSEP=P-32:PR
INT@P+32,” “;:PRINT@P+47,” “;:GO
TO3328
3360 IF P/16=>N1 THEN3330ELSEP=P
+32:PRINT@P-32,” “;:PRINT@P-17,”
 “;:GOTO3328
3362 P=P-16:IFP<32THENP=32:GOTO3
328ELSEPRINT@P+16,” “;:PRINT@P+3
1,” “;:GOTO3328
3364 IF P/16=>N1+1 THEN3330ELSEP
=P+16:PRINT@P-16,” “;:PRINT@P-1,
“ “;:GOTO3328
3366 F=P/16+(Y-1)*30-1:IF D$(F)=
“*”THEN SOUND120,1:GOTO3328ELSE
D$(F)=”*”:JK=JK+1:F$(JK)=N$(F)+”
:”+DN$:PRINT@P+1,”*”;:PRINT@P+14
,”*”;:GOTO3328
3368 UNLOAD:Q=3:GOSUB3110:GOSUB3
00
3370 FOR JJ=1 TO JK:POKE65494,0:
IF AG=0THEN TN=0
3372 GOSUB3110:PRINT@235,”access
ing”;:PRINT@296,F$(JJ);
3374 OPEN”D”,#1,F$(JJ),51
3376 FIELD#1,20AS B$(1),20AS B$(
2),11 AS B$(3)
3378 E=LOF(1):IF AG=0 THEN NT=E:
TN=TN+E
3379 K=0:I=0:GOSUB320
3380 POKE65494,0:CLOSE#1
3382 NEXT JJ
3384 Q=2:IF AG=0THEN340ELSE338
4010 POKE65494,0:XH=0:OPEN”D”,#2
,”HELP/SCN”,130
4020 FIELD#2,130 AS H$
4040 CLS8:PRINT@43,”H  E  L  P”;
4050 FOR HT=6TO13:PRINT@32*HT+8,
STRING$(16,” “);:NEXT HT:IF XH=1
THEN RETURN
4055 FOR H=HS TO HE:POKE65494,0:
GET#2,H+1:POKE65495,0
4060 H1$=MID$(H$,1,2):PRINT@32*3
+14,USING”<%%>”;H1$;
4070 FOR H1=1TO8:PRINT@32*(4+H1)
+8,MID$(H$,16*(H1-1)+3,16);:NEXT
 H1
4080 PRINT@487,”<W>ait   <R>etur
n>”;
4090 Y$=INKEY$:FOR X9=1TO500:Y$=
INKEY$:IF Y$=””THEN NEXT X9
4095 IF Y$=”W”THEN GOSUB4110:GOT
O4105
4100 IF Y$=”R”THEN CLOSE#2:POKE6
5494,0:RETURN
4105 XH=1:GOSUB4040:XH=0:NEXT H:
GOTO4040
4110 PRINT@480,”  press any key
to continue ...”;:GOSUB3010:RETU
RN
```

200 219
864 32
914 51
END 115

Listing 3: PUTWORDS

```
0 ' COPYRIGHT 1989  FALSOFT,INC
1 ' *** ACCESS temp/dat VIA pass
/wrd
10 FILES 3,630:PCLEAR1:CLEAR1500
0
15 OPEN"D",#1,"PASS/WRD",14
20 FIELD#1,12 AS A$,2 AS B$
25 GET#1,1
30 F=INSTR(A$,"/")
35 PRINT A$;"#";"  F = ";F;
62 F$=STRING$(12," ")
64 MID$(F$,1,F-1)=MID$(A$,1,F-1)
:MID$(F$,9,4)=MID$(A$,F,4)
70 CLOSE#1
82 DIM W$(3,100)
99 CLS(5):PRINT@32*7+6,"GETTING
";F$;
100 OPEN"D",#1,F$,51
110 FIELD#1,20 AS A$,20 AS B$,11
 AS C$
120 N=LOF(1)
130 FOR I=1 TO N
140 GET#1,I
150 W$(1,I)=A$:W$(2,I)=B$:W$(3,I
)=C$
160 NEXT I
200 CLOSE#1
800 ' ***SORT temp/dat ALPHABETI
CALLY
801 POKE65495,0:GOSUB2300:PRINT@
32*7+6,"sorting ";F$;:PRINT@32*8
+9,"alphabetically";
802 FOR I=1 TO N-1:K=0
803 FOR J=1 TO N-1
804 IF W$(1,J)<W$(1,J+1)THEN805
ELSE K=1:W1$=W$(1,J):W$(1,J)=W$(
1,J+1):W$(1,J+1)=W1$:W2$=W$(2,J)
:W$(2,J)=W$(2,J+1):W$(2,J+1)=W2$
:W3$=W$(3,J):W$(3,J)=W$(3,J+1):W
$(3,J+1)=W3$
805 NEXT J
807 IF K=0THEN810ELSE NEXT I
810 GOSUB2300:CLS(4):PRINT@32*4+
11,"accessing";:PRINT@32*6+12,"W
ORDLIST";
819 POKE65494,0 'SLOW DOWN TO ge
t
820 OPEN"D",#1,"WORDLIST/DAT",51
822 FIELD#1,51 AS B$
855 E=LOF(1):NL=1:NN=1:GET#1:BB$
=B$:GOSUB9000
860 K=0:FOR I=1 TO N
861 W$=STRING$(51,CHR$(0)):MID$(
W$,1,20)=W$(1,I):MID$(W$,21,20)=
W$(2,I):MID$(W$,41,11)=W$(3,I):P
RINT@32*8+6,USING"## = ";I;:PRIN
TW$(1,I);:IF K=1THEN900
862 PRINT@32*12+5,USING"#### WOR
DS IN wordlist";E+I;:PRINT@32*14
+9,USING"### WORDS TO GO";N-I;
863 NL=NN:IF NN=0THEN K=1:GOTO86
1ELSE GET#1,NN:BB$=B$:GOSUB9000
864 PRINT@32*13,USING"####";NL;:
PRINT@32*14,USING"####";NN;:PRIN
T@32*15,LEFT$(BB$,20);
865 IF LEFT$(BB$,20)<LEFT$(W$,20
)THEN863 'NEXT WORD
867 IF LEFT$(BB$,20)=LEFT$(W$,20
)THEN GOSUB9100:NEXT I:GOTO923 '
 *** (OUT) - NOT "<" OR "=" ->
RESTACK POINTERS
870 MID$(W$,48,2)=MID$(BB$,48,2)
:MM=NL:GOSUB9200:MID$(W$,50,1)=M
1$:MID$(W$,51,1)=M2$' *** CHANGE
 'W' POINTERS TO (E+I)TH & PREVI
OUS WORDS
871 LSET B$=W$:PUT#1,E+I
872 MM=E+I:GOSUB9200:MID$(BB$,48
,1)=M1$:MID$(BB$,49,1)=M2$:LSET
B$=BB$:PUT#1,NL ' *** PUT 'LAST'
 POINTER TO 'E+I'TH WORD
874 BB$=W$:GOSUB9005:GET#1,NN:BB
$=B$
875 MID$(BB$,50,1)=M1$:MID$(BB$,
51,1)=M2$
877 LSET B$=BB$:PUT#1,NN
880 ' *** PUT POINTER TO NL
888 LSET B$=W$:PUT#1,E+I
889 NN=E+I:NEXT I:GOTO923
900 MM=E+I:GOSUB9200
910 MID$(BB$,50,1)=M1$:MID$(BB$,
51,1)=M2$
912 LSET B$=BB$:PUT#1,NL
914 MM=NL:GOSUB9200:MID$(W$,48,1
)=M1$:MID$(W$,49,1)=M2$:MID$(W$,
50,1)=CHR$(0):MID$(W$,51,1)=CHR$
(1)
916 MM=E+I:GET#1,MM:BB$=B$:NL=MM
918 NEXT I
923 CLOSE#1:GOSUB2300:PRINT@32*8
+6,"going to MAINMENU";:RUN"MAIN
MENU"
1280 YY$=INKEY$
1290 YY$=INKEY$:IF YY$=""THEN129
0
1300 Y$=YY$:RETURN
2300 CLS(5):SOUND200,1:RETURN
5000 FOR X9=1 TO 500:NEXT X9:RET
URN ' *** SHORT DELAY S/R
9000 ' *** GET POINTER TO NEXT W
ORD AND CONVERT CODE ASC -> ##
9001 X1=50:X2=51:GOTO9010
9005 X1=48:X2=49
9010 NL=NN
9020 N1$=MID$(BB$,X1,1):N2$=MID$
(BB$,X2,1)
9030 N1=ASC(N1$):N2=ASC(N2$):NN=
256*N1+N2
9039 RETURN
9100 ' *** COMBINE (IF DUPLICATE
 WORD) # TIMES GIVEN, ANSWERED C
ORRECTLY AND REPEAT REQUESTS
9105 FOR II=1 TO 3
9110 A1=ASC(MID$(BB$,40+II,1)):A
2=ASC(MID$(W$(3,I),II,1)):MID$(B
B$,40+II,1)=CHR$(A1+A2)
9115 NEXT II
9120 LSET B$=BB$:PUT#1,NL
9125 RETURN
9200 M1=FIX(MM/256):M2=MM-256*M1
:M1$=CHR$(M1):M2$=CHR$(M2):RETUR
N   ' *** CONVERT ## TO CHR$
```

Listing 4: SETHELP

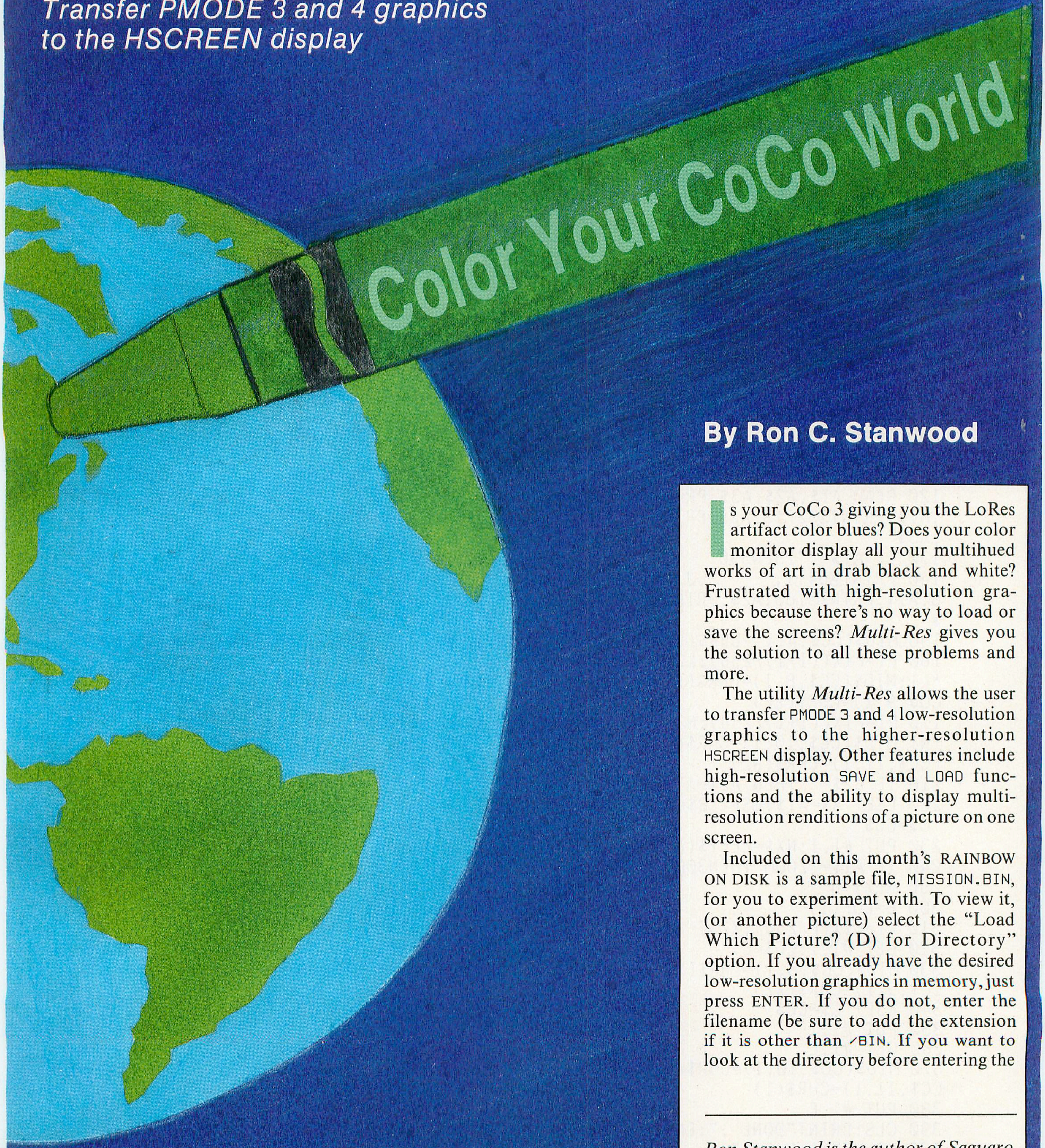
```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 OPEN"D",#1,"HELP/SCN",130
20 FIELD#1,130 AS A$
30 MU=28
40 FOR I=1 TO MU
50 B$=STRING$(130,CHR$(0))
60 READ B$
70 LSET A$=B$
80 PUT #1,I+1 '*** NOTE: THE FIR
ST LOCATION IS USED FOR DATA PAS
SING
90 NEXT I
100 PRINT "DONE"
110 END
118 '*** ( 1 - 5 ) - MAINMENU L
INE 117
120 DATA" d     <d>ATE
           CHANGE DEFAULT  DATE
....                       DEFAU
LT DATE IS USED THROUGHOUT UNLES
S CHANGED"
130 DATA" 1ALLOWS PUTTING  WORD(
S) INTO THEDIC'Y WITHOUT   CREAT
ING A  TESTOR PRACTICE FILE
           FORMAT IS:       <WOR
D>/<LEVEL>"
140 DATA" 2ALLOWS CREATING A TES
T FROM     DIC'Y WORDS     BASED
 ON GIVEN  PARAMETERS"
150 DATA" 3ALLOWS MAKING UPA TES
T FROM ALL NEW WORDS.      THESE
 ARE PUT   INTO  THE DIC'Y"
160 DATA" 4TAKE A TEST FROMTHE T
EST LIST   MENU, WHICH WILLBE CA
LLED"
288 '*** ( 6 - 8 ) - SPELLER LI
NE 200
350 DATA" 1SEARCH FOR WORDSWITHI
N STATED   PARAMETERS WHICHWILL
BE ASKED   EXAMPLES:        DIFF
ICULTY = 6 FREQUENT  MISSESFREQU
ENT REPEATS"
360 DATA" 2SEARCH THE TEST FILES
 FOR WORDS WITH SELECTED   PARAM
ETERS -    WHICH WILL BE   ASKED
"
370 DATA"  clear CANCELS   THIS
SEARCH AND TRANSFERS BACK  TO TH
E LISTING  ROUTINE (IF ANY PREVI
OUS SEARCH)OR TO mainmenu"
378 '*** ( 9 - 13 ) - SPELLER L
INE 358
380 DATA" GSEARCHES FOR    MORE
WORDS USINGNEW PARAMETERS
           NEW WORDS ARE   APPEN
DED TO THE CANDIDATE   LIST"
390 DATA" RREVIEW TEST -   LIST
IS COMPLETESELECTED WORDS  ARE R
EVIEWED    THEN PUT ON DISK"
410 DATA"UPSCROLL BACK TO  PREVI
OUS TEN    WORDS"
420 DATA"DNSCROLL DOWN TO  NEXT
SECTION"
430 DATA"##ENTER THE NUMBEROF TH
E WORD TO  BE ADDED TO THE TEST
LIST"
435 DATA" DDISPLAY DATA -  WILL
DISPLAY    DATA FIELDS ON  FORMA
TTED SCREENOF EACH WORD    REQUE
STED"
438 '*** ( 14 - 21 ) - SPELLER
LINE 302
440 DATA" 1     score
           TAKES WORDS WITH  < O
R = ENTRY  INTENDED TO FINDWORDS
 THAT CAUSEPROBLEMS"
450 DATA" 2  difficulty
           SET MIN AND MAX DIFFI
CULTY LEVELDESIRED        defau
lt values : LOW=0; HIGH=10"
460 DATA" 3    repeats
           PICKS WORDS WITHA HIS
TORY OF    REPEAT REQUESTS"
470 DATA" 4SELECT NUMBER OFWORDS
 FOR THE   AUTO-TEST MAKER
           default = 100"
480 DATA" 5auto-test maker
           'OFF ->         CANDI
DATE  WORDSWILL BE SELECTED  ...
 YOU SELECT DESIRED WORDS  FROM
THE GROUP"
490 DATA" 5auto-test maker
           ' ON' ->        WORDS
 WILL BE   SELECTED FOR THETEST
USING THE  PARAMETERS YOU  ENTER
ED (AUTO)"
500 DATA"       <clear>
              RESETS ALL    PARA
```

```
METERS TO    THEIR DEFAULT
 VALUES”
510 DATA”      <s>TART
           COMMENCE SEARCH USING
 PARAMETERSAS ENTERED”
518 ‘*** ( 22 - 27 ) — SPELLER
LINE 420
520 DATA” D<d>isplay data
           WILL DISPLAY    DATA
FIELDS ON  FORMATTED SCREENOF EA
CH WORD    REQUESTED”
530 DATA” S     <s>ave
           SAVE WORDLIST TODISK
 ... USES  SELECTED WORDS”
540 DATA” C     <c>hange
           ALLOWS CHANGING AN EN
TRY”
550 DATA”          <bar>
           SCROLL TO NEXT  SET O
F SELECTED  WORDS”
560 DATA” G<g>et more words
           REVERTS BACK TO SEARC
H FOR MORE WORDS... CURRENTWORDS
 ARE SAVED”
570 DATA” ^    go back to
           previous screen”
```

Listing 5: MAKEDICY

```
0 ‘ COPYRIGHT 1989  FALSOFT,INC
10 CLS:CLEAR:CLEAR 10000:FILES 3
,2000
20 RESTORE
30 OPEN”D”,#1,”WORDLIST/DAT”,51:
FIELD#1,20AS A$,20AS B$,11AS C$
100 I=LOF(1):FOR J=1 TO 200:I=I+
1
110 CC$=STRING$(11,CHR$(0))
120 READ A1$,A2$,A3$:PRINT@32*12
,A1$:PRINT@32*13,A2$:PRINT@32*14
,A3$
130 IF A1$=””THEN390
140 PRINT@64,I;”    “;J:PRINT@12
8,A1$:PRINT@160,A2$:PRINT@192,A3
$
150 MID$(CC$,4,1)=CHR$(VAL(A3$))
160 L1=FIX((I-1)/256):L2=I-1-256
*L1:MID$(CC$,8,1)=CHR$(L1):MID$(
CC$,9,1)=CHR$(L2)
170 N1=FIX((I+1)/256):N2=I+1-256
*N1:MID$(CC$,10,1)=CHR$(N1):MID$
(CC$,11,1)=CHR$(N2)
210 IF A2$=””THEN A2$=A1$
220 LSET A$=A1$:LSET B$=A2$:LSET
 C$=CC$
230 PUT #1,I:NX$=LEFT$(A1$,1)
240 IF A1$=”ZOOM”THEN300
250 NEXT J
300 E=LOF(1)
310 X1=FIX(E/256):X2=E-256*X1
320 GET #1,1:CC$=C$
330 MID$(CC$,8,1)=CHR$(X1):MID$(
CC$,9,1)=CHR$(X2)
340 LSET C$=CC$
350 PUT #1,1
360 GET #1,E
370 MID$(CC$,10,1)=CHR$(0):MID$(
CC$,11,1)=CHR$(1)
380 PUT #1,E
390 CLS:PRINT”DONE !”:END
500 KILL”NX$+”/BAS”
510 N=INSTR(1,LT$,NX$)
520 NX$=MID$(LT$,N+1,1)
530 LOAD NX$,R
1000 DATA “AARDVARK            “
,”ARDVARK            “,” 8"
1010 DATA “ABANDON             “
,””,” 4"
1020 DATA “ANYWHERE            “
,”ANYWHARE           “,” 5"
1030 DATA “BIOLOGY             “
,”BI OLOGY           “,” 6"
1040 DATA “BOUGHT              “
,””,” 4"
1050 DATA “CABBAGE             “
,”CABBIDGJH          “,” 6"
1060 DATA “CARRIAGE            “
,”CARRIDGJHH         “,” 7"
1070 DATA “CEREAL              “
,”CEAREEUL           “,” 4"
1080 DATA “CONSTITUTION        “
,””,” 6"
1090 DATA “DIAMETER            “
,”DI AEMUHTER        “,” 6"
1100 DATA “DOZEN               “
,”DOZZEN             “,” 6"
1110 DATA “FAILURE”,”FAILL URE”,
“ 5”
1120 DATA “FISSION             “
,”FIZZION            “,” 6"
1130 DATA “GEOGRAPHY           “
,””,” 6"
1140 DATA “LEGISLATURE         “
,”LEGIS LAITURE      “,” 7"
1150 DATA “PLATEAU             “
,”PLAET O            “,” 7"
1160 DATA “RADIUS              “
,”RAIDEE US          “,” 5"
1170 DATA “SENATE              “
,”SENNUT             “,” 6"
1180 DATA “SURGEON             “
,”SURDGUN            “,” 7"
1190 DATA “WHISTLE             “
,”WHISSEL            “,” 5"
1200 DATA “WRINKLE             “
,”REENKEL            “,” 5"
1210 DATA “ZOOM                “
,”ZOOM               “,” 4"
1220 DATA ,,
```

Transfer PMODE 3 and 4 graphics to the HSCREEN display



Color Your CoCo World

By Ron C. Stanwood

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Included on this month's RAINBOW ON DISK is a sample file, `MISSION.BIN`, for you to experiment with. To view it, (or another picture) select the "Load Which Picture? (D) for Directory" option. If you already have the desired low-resolution graphics in memory, just press ENTER. If you do not, enter the filename (be sure to add the extension if it is other than `/BIN`. If you want to look at the directory before entering the

---

Ron Stanwood is the author of Saguaro Software's CoCo Bookkeeper, and many other shareware programs for both CoCo and MS-DOS computers.

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filename, press D.

You will then be asked to enter your `HSCREEN` selection. (The resolution and number of available colors are displayed to aid in your decision). Each `HSCREEN` display has its own unique effects on the transfer, with `HSCREEN 1` being the closest to a true copy of the original.

Having selected the desired resolution, you will be asked where on the high-resolution screen you would like the transfer placed. Available options are Flush Left, Flush Right or Center. For now, just pick a number. You will be more familiar with placement after you've transferred a few pictures and/or played with the special effects created through multi-resolution transfers.

The final prompt before the transfer takes place asks: "Swap Red/Blue (Y/N)?". *Multi-Res* sets the palette registers for `HSCREEN 1` upon startup. However, it has no way of knowing which artifact colorset is in effect in your low-resolution screen, or, for that matter, which colorset was in effect when the original picture was created. If the picture you want to transfer has a blue sun and red sky or similar color inaccuracies, you can correct them here by pressing Y. From here on the procedure is automatic. Sit back and watch as your low-resolution graphics get transferred to high-resolution, or go get coffee. Complete transfer of the picture takes a few minutes. Once the transfer is completed, press any key (except the BREAK key) to return to the main menu.

As you watch the transfer take place, some very different effects are taking place behind the scene, on the other `HSCREEN`s you aren't using. On all menu selections other than Save Hi-Res, memory location $E6C6 contains a 33. This allows the user to return to the high-resolution screen without erasing it. It also allows the superimposing of one resolution over another. To see an example of multi-resolution transfer, try the following:

1. Transfer a Lo-Res picture to `HSCREEN 2`. Select Flush Right for screen placement.

2. With the first transfer complete, return to the main menu screen, select Function 3 and transfer the same low-resolution image to `HSCREEN 1`. Use Flush Left for screen placement.

3. For a final resolution, return to the main menu screen, select Function 3 and transfer to `HSCREEN` . Select Flush Right for screen placement.

Once you've finished transferring your low-resolution graphics to the desired `HSCREEN`, press the spacebar to return to the main menu screen, then select Function 2, Save Hi-Res.

The Save menu screen will appear and you will be prompted "Save Filename (no extension)?". Type in the name you wish to use for the high-resolution picture (eight characters maximum) and press ENTER. The program checks to see if enough space exists on the disk in Drive 0. If there is, your high-resolution display is saved as a four-part file, the title of each part being displayed on the screen as it is saved. Should the disk check reveal a lack of required storage space, you will be advised: Not Enough Space — Change Disks and Press Any Key to Continue. When you have changed disks, press any key except the BREAK key. The program will again check for adequate disk storage space before saving the picture.

Selecting the Load Hi-Res option transfers you to a second menu screen where you are asked to type in the name

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of the previously saved high-resolution graphics. This done, a prompt asks for an `HSCREEN` number (1 through 4) that you wish to load the graphics into, and finally, you are offered an option of changing the colorset, "Swap Red/Blue (Y/N)?", before the actual loading is displayed. The screen then shifts to the requested high-resolution display and the file is loaded while you watch. To return to the main menu, simply press the space bar.

(Questions or comments regarding this program may be directed to the author at 20727 Fraser Hwy., Apt. 5, Langley, B.C., Canada V3A 4G4. Please enclose an SASE when requesting a reply.) □

The Listing: `MULTIRES`

```
0 '*****************************
  **          MULTIRES          **
1 '** (C) 1988 BY R. STANWOOD **
2 '*****************************
3 'COPYRIGHT 1989  FALSOFT,INC
10 HSCREEN4:HSCREEN0:CLS:'Provid
es HCLS on initialization only
20 PALETTE CMP:'Fix monitor type
30 PALETTE 0,48:PALETTE 1,0:PALE
TTE 2,6:PALETTE 3,9:'Change pale
tte to match PMODE4 artifact col
ors
40 DIM H(256),V(192)
50 PRINTTAB(8)"MULTI-RESOLUTION"
:PRINTTAB(8)"GRAPHICS UTILITY":P
RINTTAB(4)"(C) 1988 BY R.STANWOO
D"
60 PRINT:PRINTTAB(5)"(1) LOAD HI
 RES":PRINTTAB(5)"(2) SAVE HI RE
S":PRINTTAB(5)"(3) LOAD/DUMP LOW
 TO HI":PRINT:PRINTTAB(9)"SELECT
 1-3":EXEC44539:A$=INKEY$:A=VAL(
A$):IFA<1 OR A>3 THEN 60
70 CLS:ON A GOTO 280,390,80
80 HSCREEN 0:PRINT:PRINTTAB(6)"L
OAD WHICH PICTURE?":PRINTTAB(7)"
(D) FOR DIRECTORY":INPUT P$:IF P
$="D" THEN DIR:GOTO80
90 PRINT"MAKE INTO:":PRINTTAB(4)
"(1) 320 X 192 4 COLOR":PRINTTAB
(4)"(2) 320 X 192 16 COLOR":PRIN
TTAB(4)"(3) 640 X 192 2 COLOR":P
RINTTAB(4)"(4) 640 X 192 4 COLOR
"
100 PRINT:PRINTTAB(9)"SELECT 1-4
":EXEC44539:A$=INKEY$:S=VAL(A$):
IFS<1 OR S>4 THEN 90
110 PRINT:PRINTTAB(8)"(1) FLUSH
LEFT":PRINTTAB(8)"(2) FLUSH RIGH
T":PRINTTAB(8)"(3) CENTRE":PRINT
:PRINTTAB(10)"SELECT 1-3":EXEC44
539:L$=INKEY$:L=VAL(L$):IF L<1 O
R L>3 THEN 110:'Select hi-res sc
reen positioning
120 IF L=2 AND S<3 THEN L=64 ELS
E IF L=2 THEN L=384 ELSE IF L=3
AND S<3 THEN L=32 ELSE IF L=3 TH
EN L=192 ELSE L=0
130 IF P$=""THEN150
140 PMODE4,1:SCREEN1,1:LOADM P$:
FOR X=1TO2000:NEXT
150 PRINT:INPUT"SWAP RED/BLUE (Y
/N)";SW$:IF SW$="Y" THEN PALETTE
 2,9:PALETTE 3,6:'Switch colorse
t if requested
160 POKE65497,0:'Set to 2Mhz
170 POKE&HE6C6,33:'Allow for ret
urn to HSCREEN with picture inta
ct
180 V=0
190 FORH=0TO255
200 PMODE3,1
210 H(H)=PPOINT(H,V):NEXT
220 HSCREEN S:FOR X=0TO255:HSET(
X+L,V,H(X)):NEXT
230 V=V+1
240 IF V<192 THEN 190
250 POKE 65496,0
260 EXEC44539:'Press any key to
continue
270 RUN
280 POKE&HE6C6,141:CLS:PRINT:PRI
NTTAB(2)"LOAD FILENAME (NO EXTEN
SION)":INPUTF$:'Return to coldst
art configuration before saving
screen
290 PRINTTAB(5);:INPUT"HSCREEN N
UMBER";H
300 PRINT:INPUT"SWAP RED/BLUE (Y
/N)";SW$:IF SW$="Y"THEN PALETTE
2,9:PALETTE 3,6
310 HSCREEN H:FOR M=&H70 TO &H73
320 POKE &HFFA2,M:'Manipulate MM
U to load into low memory
330 FI$=F$+"/HR"+HEX$(M-&H70)
340 LOADM FI$
350 NEXT
360 POKE&HFFA2,&H7A:'Return MMU
to coldstart setting
370 EXEC44539
380 POKE&HE6C6,33:RUN
390 POKE&HE6C6,141:CLS:PRINT:PRI
NTTAB(2)"SAVE FILENAME (NO EXTEN
SION)":INPUT F$
400 IF FREE(0)<16 THEN PRINT"NOT
 ENOUGH SPACE - CHANGE DISKS":PR
INT"  (PRESS ANY KEY TO CONTINUE
)":EXEC44539:GOTO400
410 FOR M=&H70 TO &H73
420 POKE &HFFA2,M
430 FI$=F$+"/HR"+HEX$(M-&H70)
440 PRINT"saving: "+FI$
450 SAVEM FI$,&H4000,&H5FFF,&H40
00
460 NEXT
470 POKE&HFFA2,&H7A
```

The New OWL-Ware Floppy Drive System

No Better System is Available at Any Price (But the Price is Great, too!)

WINDOW WRITER NOW AVALIABLE! (Described in February Rainbow)

DISK CONTROLLER

We at OWL-WARE are pleased to announce that we have purchased the rights to all of the Color Computer Products of J&M Systems. J&M has had more experience with CoCo controllers than any other supplier (except for Radio Shack® itself) and we are proud to add them to our nest! OWL-WARE will now be producing J&M controllers under the OWL brand. These controllers all use J&M's proven designs, with some minor improvements, and they will serve you for years to come.

- All gold contacts
- Works with all CoCo models (1,2,3)
- Holds 2 switchable ROMS
- Positive switching by simple jumper or optional external switch (No erratic software or pokes required)
- Buffered I/O lines to help prevent burn-out if unit accidentally pulled out with the system on
- Latching chips are socketed to speed repairs
- Does not use the WD1773 chip which caused problems with many CoCo 3 systems and is now discontinued
- Attractive all metal case
- Dealer inquiries now invited

CONTROLLER only $69.
(without ROMs)

(Add $14.95 for RSDOS
$19.95 RSDOS and OWLDOS)

See the next 2 pages for more drive and software specials from OWL-WARE

COMPUTER
CAUTION
TURN OFF POWER BEFORE
REMOVING OR INSERTING
OWL CONTROLLER
DISC DRIVE
OWL
DRIVE SYSTEM

Disk drives are not our only business, but they sure are our main business! We have been selling hard and floppy drives for the CoCo longer than any other Rainbow advertiser. **Our double sided drives are brand new, half-heights with a full one year warranty!** The full-height drives offered cheap by our competition are *used or surplus!*

QUICK FLASH!! Announcing the Most Advanced Color Computer 3 Word Processor Ever!

WINDOW WRITER

Window Writer is the first word processor which takes full advantage of OS/9. The result is a word processor which is as modern and professional in action as those previously available only for the IBM and Mac. Allows multi-taking with other programs or itself. Pull down menus and detailed help screens make learning easy and are only a key stroke (or mouse click) away. Can be user configured for everything including menu colors and contents. See the February Rainbow for preview of the early version. **Requires 80 column monitor.**

Available now at a special introductory price of:

$49. until May 15. **Normal price $59.**

(Ask about combo with spelling checker available for $20)

CASE AND POWER SUPPLY

In recent months it has become very difficult to obtain dependable, safe power supply and cases for floppy drive systems. They just couldn't pass our quality control. OWL-WARE has now produced a case and power supply that you can be proud to own and use. We believe that this is the best and most attractive drive case available for any computer.

- Built in surge protector! (we believe that this feature is unique in CoCo drive cases)
- Sleek, modern design
- Heavy-duty power supply
- Fully shielded data cable
- Modular power supply construction for ease of repairs
- Stackable case design
- Dealer inquiries now invited

SPECIAL WINTER SALE
Double Sided Drives
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OWL-WARE

Proven

On the Razor's Edge of

NEW! Improved Hard Drive Interface

Same Proven Performance for Demanding Home or Business Users at an Attractive Price

OWL-WARE has Acquired the NEW LRTech Design!

OWL-WARE has now been supplying Color Computer hard drive systems for about 4 years. We have reached our position in the hard drive market by providing our customers with a high quality product that they can be proud to own and use. These systems have been designed around the LRTech Hard Drive Interface which we believe is superior in quality to anything else on the market. **We are now pleased to announce that we have acquired the full rights to a new, improved version of this well-know product!**

There are several new features with this improved interface. These include:

- **Full SASI/SCSI compatible (this allows many add-ons to the versatile SCSI buss)**
- **Lower factory-direct prices**
- **Fast Delivery from factory stock**
- **Additional SCSI options next month!**
- **Optional Real Time Clock with built in battery (3-10 year lifetime)**
- **With the Clock you have 240 Bytes of battery backed up RAM for password protection or data storage!**
- **Same super stable LRTech quality**

Quality is obvious when compared to any other HD interface. Chip count with clock only 2 less than a 4in1 board.

Interface Price only: $85.
Real Time Clock-RAM: $25.

SASI controller is unused surplus. Add $100 for SCSI

	20 Meg.	40 Meg.	80 Meg. (2 X 40 Meg.)
System Prices: (Includes Hard Drive, case, & fan, SASI Controller, LR/OWL Interface, Software. Fully assembled and tested.)	$529.	$629.	$939.
Kit Prices: (LR/OWL System as above but not assembled or tested.)	$499.	$599.	$ 899.

Hard Drives (Drives only /with controller for B&B)

(20 Meg) $229/279 (RLL 30) $269/$329 (40) $319/$369

OWL Hard Drive BASIC 3

There have been several ads in this magazine about BASIC for Color Computer hard drive systems. These ads sometimes only tell a part of the story. Our BASIC system price includes **assembly**, **testing**, and **3-day burn-in** period. We do not require a Multi-pak to operate.

Our hard drive systems are fast, reliable, and reasonable in price. This has been proven by hundreds of users over the past 4 years. We do not have to turn off error checking for speed. We achieve high speed BASIC from a unique indexing method.

The table below will summarize some of the key points about our BASIC hard drive system and the B&B system. We believe that we have the best BASIC interface for CoCo hard drives available.

BASIC Hard Drive Systems*

Feature	OWL	B&B
Drive Portion Available at One Time	Entire	Partial (4 sections)
User Sets BASIC/OS-9 Partitions	YES	Yes
Add to Existing OS-9 Drive Without Reformat	YES	No(?)
Drives 0-3 Hard/Floppy	YES	No
Built in Park	YES	No
Speed*	FAST	Fast

*All feature details are believed to be true at time of writing and are subject to change. We believe that our BASIC hard drives are the fastest due to our indexing method, but both systems are fast. On ours all BASIC commands work including DSKINI, DSKI$, and DSKO$.

Prices: With/Without Hard Drive

$35./$79.

Window Writer

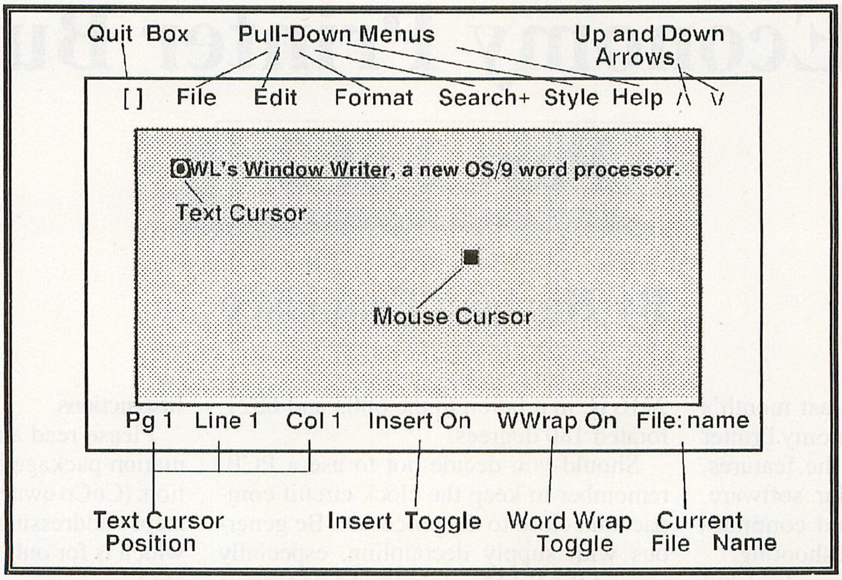
We believe this is the best word processor available for OS/9, and possibly the most advanced Color Computer word processor ever. A fully modern word processor in every way!

WINDOW WRITER NOW AVAILABLE WITH SPELLING CHECKER!

More Versatile and Powerful. OS/9 Allows you Freedom and Power. The mouse and pull-down menus give you speed and ease of use.

Multi-Tasks

Window Writer is the first Color Computer word processor which takes full advantage of OS/9. The result is a word processor which is fully as modern and professional in action as those previously available only for the IBM and Mac. The operating system allows true multi-tasking with other programs or itself. Not limited to just printing one file and editing another. You can print one file in one window while you edit files in other windows. At the same time you can be running a small program in another window. You can cut and paste between sections of files in different windows.



Pull Down Menus and Help Screens

A full selection of pull down menus and detailed help screens make learning easy and are only a key stroke (or mouse click) away. All menus and help screens can be user configured for everything including menu colors and contents. You don't like the color of a menu? You think one menu item should be listed differently? Change them!

The menus and help screens can be reached by cursor keys or the mouse (or joystick) or can be accessed by control keys.

Hi-Res Display

Window Writer uses an **80-column monitor display** screen for clarity. As shown in the above screen drawing, you can quickly see how to access the menus and help screens. You can determine the current position by page, line number, and column. The mouse can use this section to quickly change to a specific page or line in the file. The text insert and word wrap toggles also are indicated and changeable with the mouse button.

Ram Disk

A RAM disk is set up in **Window Writer** to make full use of all or a user specified portion of the memory on the 512K CoCo 3. On the 128K CoCo a smaller RAM disk is set up to still allow use of all available memory for file editing. For use of all features, a 512K machine is required.

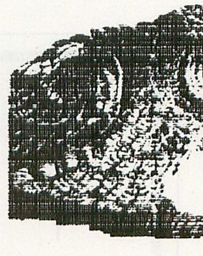
The RAM disk is used for storage of the file(s) being edited, for the clipboard for cut and paste, and as a print spooler for the file being printed. **Window Writer's** clipboard can be saved to disk or pasted into any file being edited because files use the same clipboard memory. The RAM disk also can be used with other OS/9 programs.

Mail-Merge

With **Window Writer** you can create form letters and send them out to a list of addresses in an address file. First names or other information can be added to "personalize" these letters.

OWL's Efficient Mouse Useage

(Makes editing a snap!)



Editing

Like most modern word processors, with **Window Writer** there is always more than one way to access any editing feature. You can access editing by menus using mouse, "keyboard mouse", or through control keys. Full help screens are quickly available for all editing features. A help screen can be left visible while needed and then quickly removed to get back to full screen editing.

One nice feature is the price:

only $59.

For the DynaSpell Spelling Checker by Dale Puckett:

only $20. additional!

More →

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The Economy Printer Buffer

Part 2 of 2

By Harleen Francisco

This article continues last month's discussion of the Economy Printer Buffer. We covered the features, hardware, interfaces, modular software, simple code and benefits, and continues with construction and troubleshooting.

None of the components are critical, but please note that an external-clock version of the processor, the MC6803E, is not suitable for this design. A regulated 5v supply capable of delivering 1A is needed; typical current requirements are about 500ma.

Although construction is straightforward, use of a PCB is recommended. High-quality IC sockets should be used for the processor, the PIA and RAM. These few components should be inserted last to avoid not only damage to the more expensive components, but also wasting a lot of time in tracing faults resulting from the damage. It is advisable to perform a continuity test before inserting the processor, PIA or memory devices. Note that on the PCB, the 2716 is, in relation to the 6803 and 6821, rotated 180 degrees.

Harleen Francisco is a pediatric nurse who enoys working with children. Her hobbies include music, horseback riding and computers. Harleen, together with her husband, Gene, design and develop computer peripherals.

Should you decide not to use a PCB, remember to keep the clock circuit compact and close to the processor. Be generous with supply decoupling, especially around the RAMs. Finally, be conscious of handling MOS devices by grounding yourself. (Don't wear a long shirt.)

There are three operating modes on the printer buffer determined by the state of the mode switches immediately after power-up. These switches, shown on the circuit, act as follows. (See Table 1.)

W/J4	W/J3	W/J2	Operation
1	0	0	Serial-to-parallel
1	0	1	Serial-to-parallel (ext. baud option)
1	1	1	Parallel-to-parallel

Table 1

Repeat Copies

Keeping the abort/repeat key pressed for more than a second or so causes printing to abort, provided that it is not already completed, and resets the `BUFIN` pointer to the start of the user data. The error `LED` will light to indicate this. Subsequent releasing of the key initiates printing of a further copy after a short delay. This may be performed as many times as you want.

Instructions

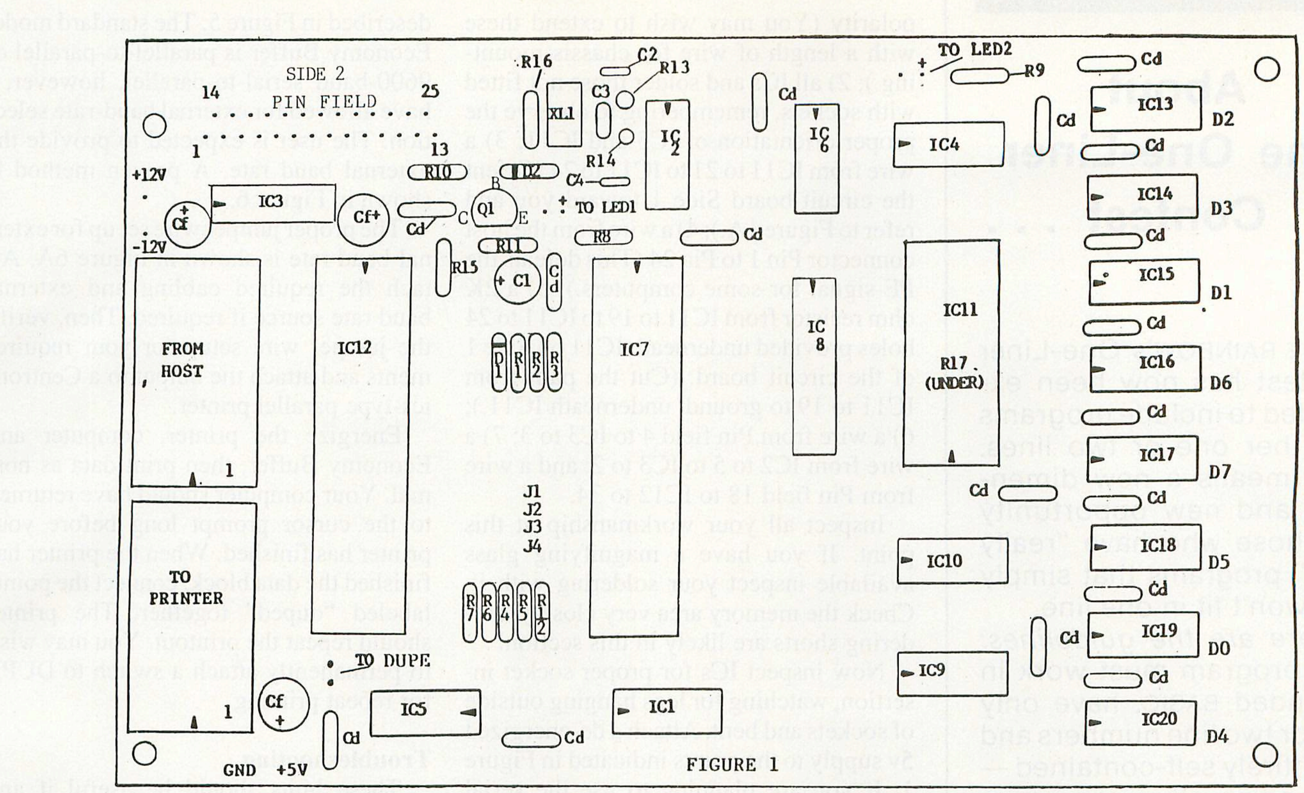
Please read and understand this information package before starting construction. (CoCo owners should disregard those steps addressing the parallel version, which is for only TRS-80 Model III owners.)

Begin construction by gathering the necessary parts (all are readily obtainable). For economy measures, sockets are not called out in the parts list. However, I do recommend socketing at least the major items, CPU, ROM and Memories.

Orient the circuit board Side 2 toward you and refer to Figure 1. Install and solder all resistors, observing R13 and R14, which stand on end. Then install and solder all .1µF decoupling capacitors labeled as Cd. Likewise, install and solder diodes and remaining capacitors, remembering to observe polarity where indicated. Following these, install and solder sockets where required. Complete socketing will aid your troubleshooting if you make an error. Remember to observe the proper orientation of IC5 and IC11. Finally, install and solder the crystal.

At this point, recheck your work. All passive components should be in place and soldered.

Now, install and solder the following: 1) the LEDs, remembering to observe


SIDE 2
PIN FIELD
14
25
1
13
+12V
-12V
GND
+5V
Cf
Cf+
Cd
IC3
R10
D2
C4
R14
R16
C2
R13
C3
XL1
IC 2
Cd
IC 6
IC4
Q1
B
C
E
TO LED1
R8
R11
R15
C1
FROM HOST
IC12
IC7
D 1
R 1
R 2
R 3
IC 8
IC11
R17 (UNDER)
J1
J2
J3
J4
R 7
R 6
R 4
R 5
R 2
TO PRINTER
TO DUPE
IC5
IC1
IC9
IC10
TO LED2
R9
IC13
D2
IC14
D3
IC15
D1
IC16
D6
IC17
D7
IC18
D5
IC19
D0
IC20
D4

R1-R7	10K OHMS	D1-D2	1N914	IC1	74LS11	IC9-IC10	74LS157
R8-R9	150 OHMS	XL	4.9152 MHZ	IC2	74LS04	IC11	MCM2716
R10-R11	3K OHMS	C1	10uf	IC3	MCM1488	(2716 SUPPLIED WITH	
R12	10K OHMS	C2-C4	20pf	IC4	74LS00	REQUIRED SOFTWARE)	
R13-R14	2K OHMS	C3	.01uf	IC5	74LS27	IC12	68A21
R15-R16	10K OHMS	Cf	100uf	IC6	74LS74	IC13-IC20	MCM6665
R17	2K OHMS	Cd	.1uf	IC7	6803-1	(MEMORY MUST SUPPORT	
(R17 UNDER IC11)		Q1	2N3904	IC8	74LS373	RAS ONLY REFRESH)	

Figure 1

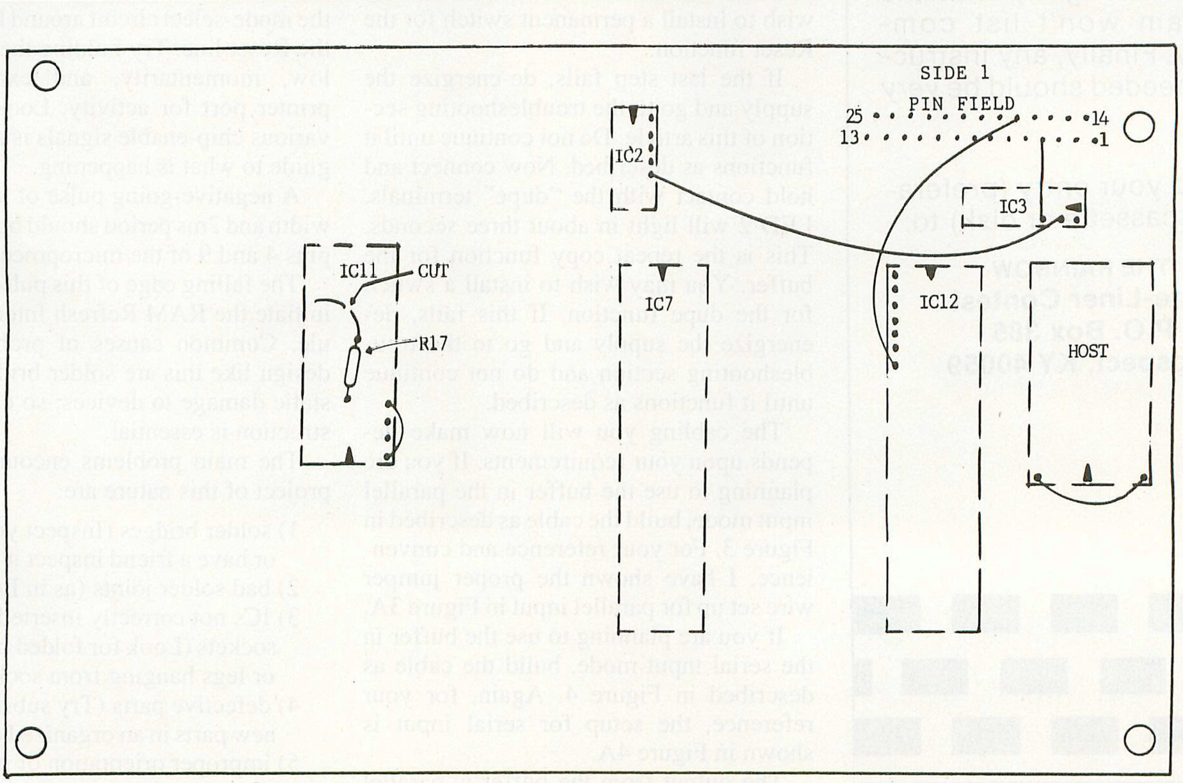

SIDE 1
PIN FIELD
25
13
14
1
IC2
IC3
IC11
CUT
R17
IC7
IC12
HOST

Figure 1A

About The One-Liner Contest . . .

THE RAINBOW's One-Liner Contest has now been expanded to include programs of either one or two lines. This means a new dimension and new opportunity for those who have "really neat" programs that simply just won't fit in one line.

Here are the guidelines: The program must work in Extended BASIC, have only one or two line numbers and be entirely self-contained — no loading other programs, no calling ROM routines, no poked-in machine language code. The program has to run when typed in directly (since that's how our readers will use it). Make sure your line, or lines, aren't packed so tightly that the program won't list completely. Finally, any instructions needed should be *very* short.

Send your entry (preferably on cassette or disk) to:

THE RAINBOW
One-Liner Contest
P.O. Box 385
Prospect, KY 40059

polarity (You may wish to extend these with a length of wire for chassis mounting.); 2) all ICs and solder those not fitted with sockets, remembering to observe the proper orientation of IC5 and IC11; 3) a wire from IC11 to 21 to IC11 to 24 (Orient the circuit board Side 1 toward you and refer to Figure 1A.); 4) a wire from the host connector Pin 1 to Pin 24 (This defeats the PE signal for some computers.); 5) a 2K ohm resistor from IC11 to 19 to IC11 to 24 holes provided underneath IC11 on Side 1 of the circuit board. (Cut the path from IC11 to 19 to ground, underneath IC11.); 6) a wire from Pin field 4 to IC3 to 3; 7) a wire from IC2 to 5 to IC3 to 2; and a wire from Pin field 18 to IC12 to 34.

Inspect all your workmanship at this point. If you have a magnifying glass available inspect your soldering with it. Check the memory area very closely, soldering shorts are likely in this section.

Now inspect ICs for proper socket insertion, watching for legs hanging outside of sockets and bent. Attach a de-energized 5v supply to the points indicated in Figure 1. If you are planning to use the serial input, you must also provide +12 volts and -12 volts. A supply suitable for powering the buffer is shown in the schematic. (See Figure 2.) Energize the power supply. Momentarily connect Pin field 18 to GND, with both LEDs lighting as contact is made. Then remove the connection, checking that both LEDs go out. This is the reset connection for the buffer. You may wish to install a permanent switch for the Reset function.

If the last step fails, de-energize the supply and go to the troubleshooting section of this article. Do not continue until it functions as described. Now connect and hold contact with the "dupe" terminals. LED 2 will light in about three seconds. This is the repeat copy function for the buffer. You may wish to install a switch for the dupe function. If this fails, de-energize the supply and go to the troubleshooting section and do not continue until it functions as described.

The cabling you will now make depends upon your requirements. If you are planning to use the buffer in the parallel input mode, build the cable as described in Figure 3. For your reference and convenience, I have shown the proper jumper wire set up for parallel input in Figure 3A.

If you are planning to use the buffer in the serial input mode, build the cable as described in Figure 4. Again, for your reference, the setup for serial input is shown in Figure 4A.

The output from the buffer is parallel and the output cable should be built as described in Figure 5. The standard model Economy Buffer is parallel-to-parallel or 9600-baud serial-to-parallel, however, I have allowed for external baud-rate selection. The user is expected to provide the external baud rate. A proven method is shown in Figure 6.

The proper jumper wire set up for external baud rate is shown in Figure 6A. Attach the required cabling and external baud rate source if required. Then, verify the jumper wire setup for your requirements and attach the output to a Centronics-type parallel printer.

Energize the printer, computer and Economy Buffer, then print data as normal. Your computer should have returned to the cursor prompt long before your printer has finished. When the printer has finished the data block, connect the points labeled "duped" together. The printer should repeat the printout. You may wish to permanently attach a switch to DUPE for repeat printing.

Troubleshooting

These hints should be useful if any debugging proves necessary. Using an oscilloscope, recheck the oscillator, and switch it off immediately if it is not running. You probably have a short circuit somewhere around the microprocessor. If the clock is running, check that the E-clock and AS are functioning properly.

Check that there is "sensible" activity on the data and address buses. If not, check the mode-select circuit around P0 to 2, and the Reset line. Try holding the Reset line low, momentarily, and examine the printer port for activity. Looking at the various chip-enable signals is also a good guide to what is happening.

A negative-going pulse of about 34ms width and 2ms period should be present on pins 4 and 9 of the microprocessor.

The falling edge of this pulse is used to initiate the RAM Refresh Interrupt Module. Common causes of problems in a design like this are solder bridges and/or static damage to devices; so care in construction is essential.

The main problems encountered in a project of this nature are:

1) solder bridges (Inspect your work or have a friend inspect it for you.)
2) bad solder joints (as in Item 1)
3) ICs not correctly inserted in sockets (Look for folded over legs, or legs hanging from sockets.)
4) defective parts (Try substituting new parts in an organized manner.)
5) improper orientation of parts

(Check your work against Figure 1.)

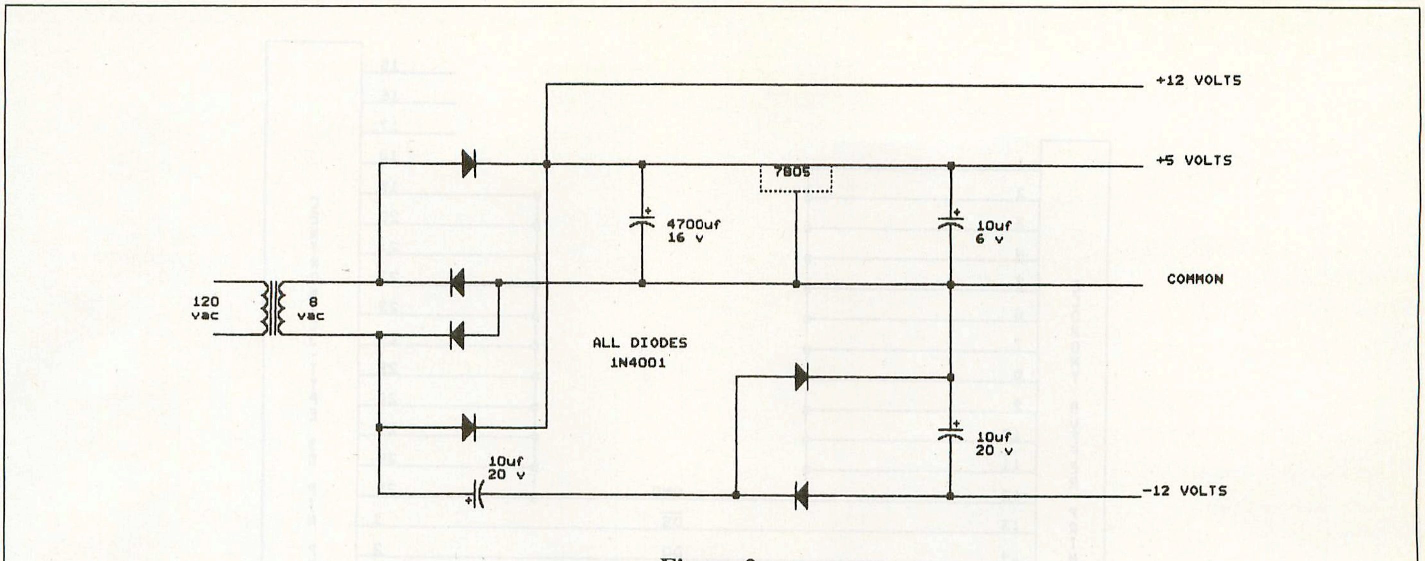

+12 VOLTS
+5 VOLTS
7805
4700uf
16 v
10uf
6 v
COMMON
120
vac
8
vac
ALL DIODES
1N4001
10uf
20 v
10uf
20 v
-12 VOLTS

Figure 2

If you have an oscilloscope you may check the following:

— Observe the clock signal at Pin 3 of IC7 (6803). The frequency of the symbol should be 4.9152MHz.

— Observe the E-signal at Pin 40 of IC7 (6803). The frequency of the symbol should be 1.2288MHz.

— Observe the Refresh Timer at pins 4 and 9 of IC7 (6803). It should be a negative going pulse of 3µs with a period of two milliseconds.

— Observe the AS signal at Pin 39 of IC7 (6803) and Pin of IC11 (74LS11). The frequency should be a positive going pulse of 170 ns.

— Observe the address and data lines (all will be active).

— Depress the Reset switch. Both the error (LED2) and the busy (LED 1) should come on and remain on while the Reset switch is depressed. Both will go off when the switch is released.

— Depress and hold the dupe switch. Both LEDs should remain off, but if you continue to hold for about three seconds, the error (LED 2) should come on.

[The printed circuit board (a double-sided board) is available for $25 from the author at the address below. Also available is the programmed EPROM for $10.]

(Questions or comments concerning this project may be addressed to the author at 8332 Peggy Street, Tampa, FL 33615. Please include an SASE when requesting a reply.) ❑

W4	NC
W3	NC
W2	NC
W1	NC

Figure 3A

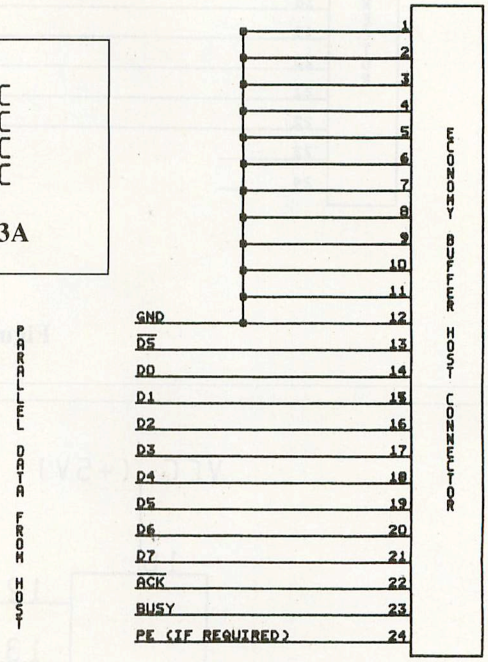

1
2
3
4
5
6
7
8
9
10
11
GND 12
DS 13
D0 14
D1 15
D2 16
D3 17
D4 18
D5 19
D6 20
D7 21
ACK 22
BUSY 23
PE (IF REQUIRED) 24
PARALLEL DATA FROM HOST
ECONOMY BUFFER HOST CONNECTOR

Figure 3

INTERNAL 9600 BAUD		EXTERNAL 300-9600 BAUD	
W4	IN	W4	IN
W3	NC	W3	NC
W2	NC	W2	IN
W1	NC	W1	NC

Figure 4A

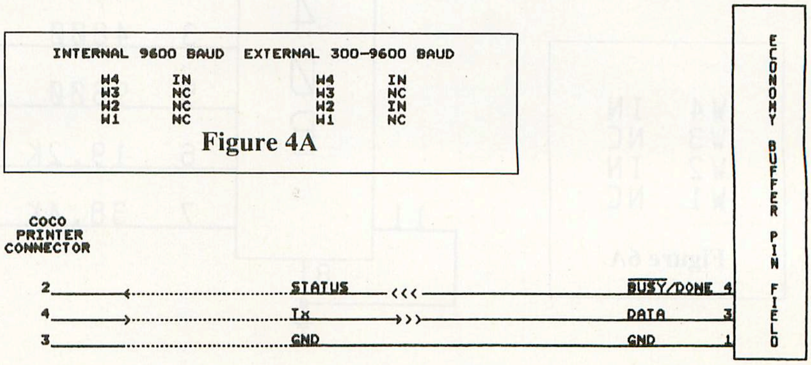

COCO
PRINTER
CONNECTOR
2
4
3
STATUS
Tx
GND
<<<
>>>
BUSY/DONE 4
DATA 3
GND 1
ECONOMY BUFFER PIN FIELD

Figure 4

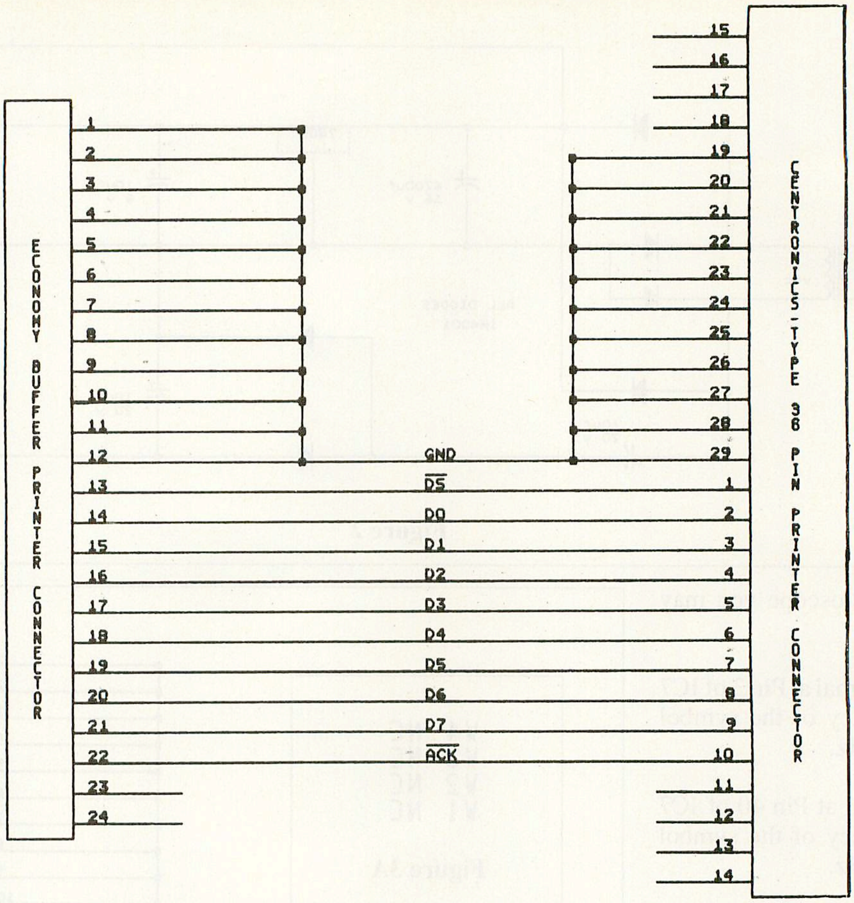
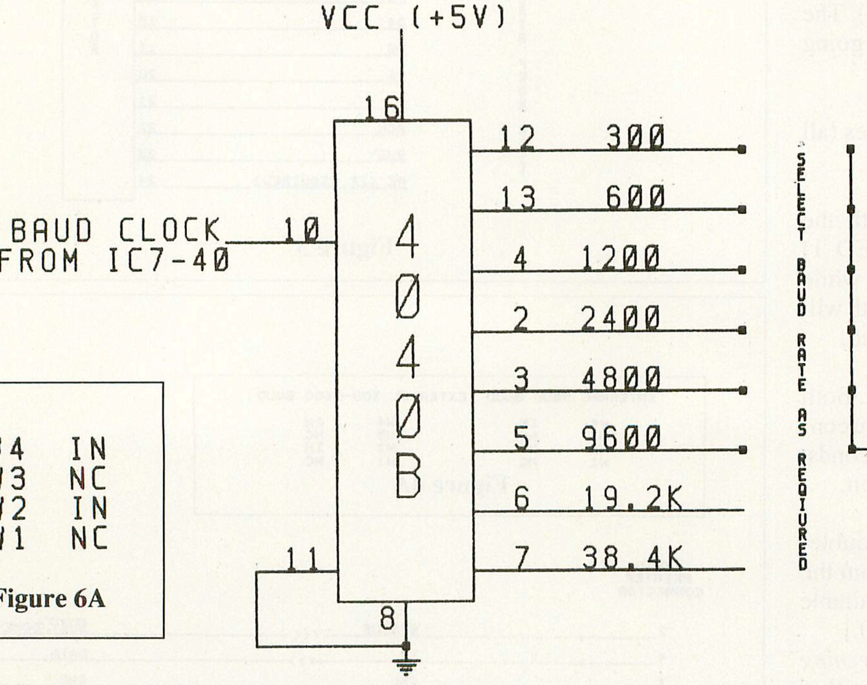

ECONOMY BUFFER PRINTER CONNECTOR
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
GND
$\overline{DS}$
D0
D1
D2
D3
D4
D5
D6
D7
$\overline{ACK}$
CENTRONICS-TYPE 36 PIN PRINTER CONNECTOR
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
1
2
3
4
5
6
7
8
9
10
11
12
13
14

Figure 5


VCC (+5V)
16
BAUD CLOCK FROM IC7-40
10
4040B
11
8
12 300
13 600
4 1200
2 2400
3 4800
5 9600
6 19.2K
7 38.4K
SELECT BAUD RATE AS REQUIRED
TO IC7-10

W4	IN
W3	NC
W2	IN
W1	NC

Figure 6A

Figure 6

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COCO Q&A CONSULTATIONS

By Marty Goodman
Rainbow Contributing Editor

Ribbon Replacements

My DMP-105 printer no longer winds used printer ribbon into its cartridge. As far as I can tell, this is the only problem it has. Replacing the ribbon cartridge did not fix the problem. What can I do?

Keith Bauer
Menominee, Michigan

The problem is apparently with the ribbon take-up mechanism. Inspect the printer carefully and see if you can find a problem with the gears turning the shaft that causes the ribbon to wind. If you see an obvious source for the problem, it might pay to buy the Tandy service manual for that printer and order the needed broken gear or shaft.

The DMP-105 is not, in my opinion, worth repairing. I suggest getting one of the current low-end Panasonic or Gemini NX printers. For about $140 to $200 they are superior to the DMP-105 and will last a lot longer.

Occasionally Tandy puts its DMP-132 printer on sale for $250 or so, and at that price it is a good choice for those afraid to buy non-Tandy brand equipment. Considering it comes with a serial input built-in, it is quite competitive with various third-party alternatives. Personally, I prefer the third-party items offered by RAINBOW advertisers.

More Computer Crashes

When I run a program that causes the computer to rapidly flip in and out of `PMODE 0,1:SCREEN 1,1 (10 PMODE 0,1:SCREEN 1,1:T=T+1:PRINT T;:GOTO 10)`, *my computer crashes.* BREAK *and* Reset *will not work, though a cold start (*CONTROL-ALT-Reset*) works. I have a 512K CoCo 3. What is wrong here?*

Wendell G. Bartlett
N. Anson, Maine

I ran the exact same program on my CoCo and had no problems. I suspect the problem is a flaw in the timing of your GIME chip, which could be fully corrected with a 1987 model GIME chip. Unfortunately, '87 GIME chips cost about $50 if ordered from National parts.

Check the date on your GIME chip. Is it dated 1986? If so, you've likely found the problem. If dated 1987, I'm stumped.

Color Restoration

How can I restore color to games that show red and blue colors when used on a CoCo 2, but show only black and white stripes when used with my RGB monitor on a CoCo 3?

Robert Titmas
Howell, New Jersey

It appears you purchased one of the less-capable RGB monitors (like a CM-8 from Tandy) that does not take both RGB and color composite video. It is because of the problem you describe that I have repeatedly recommended that folks buy the Magnavox 8CM515 monitor or a Sony KV1311CR monitor. If your RGB monitor (CM-8) cannot accept a composite color video (RCA jack) input, then you do have one alternative that works some of the time: Try *RGB Patch* sold by Microcom. This will fix the colors for the RGB monitor when used with a good fraction of Radio Shack Disk BASIC based games, although it will not do much for games like *Rocky's Boots* and *Robot Oddessy*, which operate under OS-9.

Scripsit Font Selection

How can I get Scripsit II *to select fonts on my Centronics brand printer?*

Willard G.Langham
Burbank, California

I suggest trying a different word processor. I have no problem selecting any printer's fonts using *Telewriter*, *Word Power 3.2* or *VIP Writer*. I believe of those three, *VIP Writer III* is available in a version that runs on a cassette-based system.

Old Gray CoCo

My old gray CoCo "ain't what it used to be." It crashes after a few minutes of operation. I took it to Radio Shack (under a "maintanance contract") and they returned it saying there was no problem.

Ray Wedynsneki
Shakertown, Pennsylvania

When I encounter such a problem, I try a new SAM (74LS783) chip or a new CPU (6809E) chip from my stock of parts. If replacing one or both of those chips does not work, try replacing the memory chips (4164). If that does not fix the problem, don't waste any more time on it. Consider purchasing a newer CoCo.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P. O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we recieve, we are unable to answer letters individually.

Questions can also be sent to Marty through the *Delphi* CoCo SIG. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then , at the RAINBOW> prompt , type ASK (for Ask the Experts) to arrive at the EXPERTS> prompt , where you can select the "CoCo Consultations"on line form which has complete instructions.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW*'s CoCo SIG and database manager of OS-9 Online. His noncomputer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.*

Sugar Software

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- Set #**6** Block and Computer;
- Set #**7** Small: Roman, Italics, Cubes, etc;
- Set #**8** Novelty fonts;
- Set #**9** Gallant and Spartan;
- Set #**10** Several Roman fonts;
- Set #**11** Gothic and Script;
- Set #**12** More Roman and Italic;
- Set #**13** Several Courier fonts;
- Set #**14** Modern and Screen;
- Set #**15** Tektron and Prestige.

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- Pkg #3 - Above font sets 7, 8 and 9;
- Pkg #4 - Above font sets 10, 11 and 12;
- Pkg #5 - Above font sets 13, 14 and 15.

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Sample Calligrapher Fonts

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A quicker way to draw a line

Machine Language Made BASIC

Part XIII: Getting More Graphic

By William P. Nee

The `LINE` routine in ROM is an efficient but slow way of connecting two points. This routine computes, then sets the bit and byte for every point, but there is a quicker way to draw a line once you've gotten the first bit and byte. The only additional information you need is the slope of the line — the ratio of the y length to the x length.

To draw a line you need to get the $x1,y1$ and $x2,y2$ coordinates, compute the slope, then `PSET` from the start to the end. There are four possible line types to consider:

a) $x1<x2$ and $y1<y2$ and $(y2-y1)<(x2-x1)$
b) $x1<x2$ and $y1<y2$ and $(y2-y1)>(x2-x1)$
c) $x1<x2$ and $y1>y2$ and $(y2-y1)<(x2-x1)$
d) $x1<x2$ and $y1>y2$ and $(y2-y1)>(x2-x1)$

If $x1$ is greater than $x2$, reverse $x1,y1$ with $x2,y2$ to force $x1 < x2$. The difference in the x coordinates $(x2-x1)$ is called dx; the difference in the y coordinates $(y2-y1)$ is dy. The slope of a line is dy/dx and you'll arrange to keep it between zero and one.

For the first line type, say that $x1=0$, $y1=191$, $x2=255$, and $y2=0$, a line from the lower-left corner to the upper-right corner. $x2-x1$ is 255-0, so dx=255; $y2-y1$ is 0-191, or -191, but this is because the computer numbers from the top down instead of from the bottom up. To make the display look correct, compute dy as -191 but then make dy negative, which lets you use dy as +191. Now the slope of dy/dx appears positive.

Bill Nee bucked the "snowbird" trend by retiring to Wisconsin from a banking career in Florida. He spends the long, cold winters writing programs for his CoCo.

In `PMODE 4`, the x distances always increase by one bit and the y distances always decrease by the slope. The number of points to set is $(x2-x1)+1$, or dx+1. Start by setting the bit in the byte corresponding to $x1,y1$ then decrease the point counter. Once the bit and byte are computed, all changes will be from there, so use Register A as the current bit and Register X as the current byte. The point counter keeps track of how many more bits to set.

The next x position is one bit to the right. If already in the right-most bit, moving one bit more to the right puts you in the first bit of the next byte, where you need to reset the bit (Register A) to zero and increase the byte (Register X) by one. If not in the right-most position, move on to the slope.

While keeping track of the slope in Register B, when we add the slope any result greater than or equal to a value of one sets the carry bit in the CC register. Remember, the slope is always represented as a fraction, which can be checked with a BCC. If the carry bit is clear, set the bit/byte and get the next position. If the carry bit is set, set the bit in the byte just above the current byte, or byte minus 32. In either case, decrease the point counter and compute the next position. When the point counter is zero, you are finished drawing the line. Using only one byte for the slope, some calculations may be one row off at the end, which is more than compensated for by the program's execution speed.

Follow through Listing 1 at the end of the article. This program draws a line from 0,191 to 255,0. (Location $FF/100 was set to #$2000 before entering the program.) Initially the number of points in `DCOUNT` was 256, or Hex 0, but since the count is decreased before seeing if it has reached zero, it takes 256 (dx+1) repetitions to get back to zero and end the routine.

That takes care of only one of three line types. Table 2 shows how to arrange all four line types. Remember, there is always $x1<x2$. If dx=0, the program draws a horizontal line; if dy=0, the program draws a vertical line. If dx=dy, the slope is the highest fraction possible, which is #$FF. It takes a two-byte slope to get #$0100.

First, let's check $x1$ and $x2$ with:

```
LDA        X1
CMPA       X2
BLE        CONTINUE
LDB        X2
STA        X2
STB        X1
LDA        Y1
LDB        Y2
STA        Y2
STB        Y1
```

$FF02 (output)

VALUE	FE	FD	FB	F7	EF	DF	BF	7F
$ FE	@	A	B	C	D	E	F	G
F FD	H	I	J	K	L	M	N	O
F FB	P	Q	R	S	T	U	V	W
0 F7	x	y	Z	*UARR	*DARR	*LARR	*RARR	space bar
0 EF	0	1	2	3	4	5	6	7
(INPUT) DF	8	9	:	;	,	-	.	/
BF	ENTER	CLEAR	BREAK					

*UARR=up arrow *DARR=down arrow *LARR=left arrow *RARR=right arrow

```
LDA #$(OUTPUT Value)
STA $FF02
LDA $FF00
CMPA #$(INPUT Value)
BEQ
```

Check for:	OUTPUT	INPUT
Up arrow	F7	F7
Down Arrow	EF	F7
Left Arrow	DF	F7
Right Arrow	BF	F7

Table 1: Color Computer Keyboard

Next, check if *y*1 is less than *y*2 (Line Type a or b), or greater than *y*2 (Line Type c or d). Then compare d*x* and d*y* to see if you need to compute Slope Type a (d*y*/d*x*) or Slope Type b (d*x*/d*y*).

It takes four slightly different routines to draw each of the four possible lines. The differences in each are `DCOUNT`, the change in *x* directions (by bit or slope), and the change in *y* directions (by slope or bit). You can use the chart to see if the *y* change is positive or negative; the *x* change is always going to be positive since you are drawing from left to right (*x*1<*x*2).

Whenever d*y* is greater than d*x* (Line Type b or d), the changes in *x* and *y* are computed in the opposite way. The *y* change is always one byte higher or lower (byte plus or minus 32). The *x* change increases to the right by the amount of the slope in Register B. If the slope sum is less than one (carry is not set), the same bit is used; if the slope sum is one or more, the next bit to the right is used. The bit must then be checked to see if it is actually the first bit in the next byte.

What do you do with a machine language program that draws lines? Since it draws so quickly, maybe you can combine this program with a previous one. How about using it with the 3-D Rotation Program by plotting your own coordinates, connecting them with lines, then rotating the entire display?

The program in Listing 2 starts by reading the coordinates. (The necessary data is stored by Listing 3 so you will need to run it first.) Keep them between -50 and +50 so they don't rotate off the screen. If you need a coordinate greater than 50, be sure that `SQR(`*x***x*+*y***y*+Z*Z) is 90 or less. Remember, all coordinates are in relation to the center of the screen at 0,0,0. Coordinates are stored as two-byte numbers starting at $6700.

TYPE	CONDITIONS	SLOPE	xCHANGE	yCHANGE	DCOUNT
a *y*1<*y*2	d*y*<d*x*	-d*y*/d*x*	+1 BIT	-SLOPE	d*x*+1
b *y*1<*y*2	d*y*>d*x*	d*x*/-d*y*	+SLOPE	-1 BIT	d*y*+1
c *y*1>*y*2	d*y*<d*x*	d*y*/d*x*	+1 BIT	+SLOPE	d*x*+1
d *y*1>*y*2	d*y*>d*x*	d*x*/d*y*	+SLOPE	+1 BIT	d*y*+1

Table 2:

The program then reads the beginning and end point of each line, storing them in a line table starting at $6500. Point one is at Location $6700+0, Point two at Location $6700+6, etc, while any point is at Location $6700+(Point-1)*6. For a line between Point 5 and 7, the program stores (5-1)*6 and (7-1)*6 in the line table. The line numbers are added later to $6700, locating *x*1,*y*1,*z*1 and *x*2,*y*2,*z*2.

The program then displays the object and waits for you to approve or change it. Once approved, all coordinates are rotated, all lines are drawn, and the new picture is displayed. Pressing X rotates the object around the *x* axis; pressing Y rotates it around the *y* axis; and pressing Z rotates it around the *z* axis. Not pressing any key stops the action, and pressing BREAK ends the program.

The point coordinates (two bytes each) for *x*, *y* and *z* are stored in a table beginning at $6700. The line coordinates (*x*1,*y*1, and *x*2,*y*2) are also two bytes each and are stored in a table beginning at $6500. Since each line takes four bytes, you can store 127 lines before running into the point table. If you need more lines, move the point table to $6800 or $6900. Remember, the work area for point rotation starts at $7000 - but, this too, can be relocated.

One subroutine needing some explanation is `PICK`. This routine allows you to hold a key down for continous movement rather than pressing it each time. The Color Computer keyboard is like a big matrix (see Table 1).

What do you do with a machine language program that draws lines? Since it draws so quickly, maybe you can combine this program with a previous one.

Every key pressed has a value in $FF02 (output) and $FF00 (input). To check for a certain key, load Register A with its output value and store this in $FF02. Then load Register A with the contents of $FF00 and compare A to the desired key's input value. If they are equal, that key has been pressed. To check for the letter X, the commands are:

```
LDA     #$FE      "X" OUTPUT VALUE
STA     $FF02
LDA     $FF00
CMPA    #$F7      "X" INPUT VALUE
BEQ     XROTAT
```

To make the picture more realistic, all the lines are in perspective, based on the *z* distance. Any point at zero *z* distance has a perspective factor of one; all other points have a factor of (128-Z)/128. The 128 distance was chosen to make division easier by using shifts. New $x1$=128+(128-Z)*x/128; new $y1$=96-(128-Z)*y/128. These are the points now used to draw the lines.

Finally, all symbols are assigned at the beginning of the program. During the `LINE` subroutine the DP register is set to #$60, speeding up the program since the computer now only has to read one-byte locations (the $60 is assigned by the DP register). Listing 3 shows how to run the program from BASIC. Using data lines lets you check coordinates as you go along. The listing takes a while to

Listing 1: `BINLINE`

```
00050 TITLE    MACHINE LANGUAGE PROGRAM1
00100          ORG     $3000
00110 START    LDB     #4       PMODE
00120          JSR     $9628
00130          LDB     #1       PAGE
00140          JSR     $9653
00150          JSR     $9542    PCLS
00160          LDB     #1       GRAPHICS
00170          JSR     $95AA
00180          LDB     #1       COLOR SET 1
00190          JSR     $9682
00200          LDA     #0
00210          STA     X1
00220          LDB     #191
00230          STB     Y1
00240          LDA     #255
00250          STA     X2
00260          LDB     #0
00270          STB     Y2
00280          LDA     X2
00290          SUBA    X1
00300          STA     DX       (X2-X1)
00310          INCA
00320          STA     DCOUNT   DX+1
00330          LDB     Y2
00340          SUBB    Y1
00350          NEGB
00360          STB     DY        -(Y2-Y1)
00370          BSR     CSLOPE
00380          BSR     BYTE
00390 LOOP4    PSHS    B
00400          LDB     ,X       BYTES'S OLD CONTENTS
00410          ORB     A,U      (NEW)OR(OLD)
00420          STB     ,X       BYTE'S NEW CONTENTS
00430          PULS    B
00440          DEC     DCOUNT   ONE LESS BIT TO SET
00450          BEQ     DONE     FINISHED?
00460          INCA
00470          CMPA    #8       GONE TO FAR RIGHT?
00480          BLO     LOOP5    IF NOT, CONTINUE
00490          CLRA             IF SO, BACK TO 0
00500          LEAX    1,X      AND NEXT BYTE OVER
00510 LOOP5    ADDB    SLOPE    ADD THE SLOPE
00520          BCC     LOOP4    IF NOT >1 THEN CONTINUE
00530          LEAX    -32,X    ELSE GO UP ONE BYTE
00540          BRA     LOOP4
00550 DONE     JSR     $ADFB    INKEY$
00560          CLRB             SET FOR TEXT
00570          JSR     $95AA
00580          SWI              RTS IF IN BASIC
00590 CSLOPE   LDA     DY       DIVISOR
00600          LDB     DX       DIVIDEND
00610          STB     DIVSR
00620          LDB     #8       8 BIT ACCURACY
00630          STB     COUNT
00640          CLRB
00650 LOOP1    ASLB             ADJUST AWAY FROM DECIMAL
00660          ROLA
00670          BCS     LOOP2
00680          CMPA    DIVSR
00690          BLO     LOOP3
00700 LOOP2    SUBA    DIVSR
00710          INCB
00720 LOOP3    DEC     COUNT
00730          BNE     LOOP1
00740          STB     SLOPE
00750          RTS
00760 BYTE     LDA     Y1
00770          LDB     #32      BYTES/LINE
00780          MUL
00790          ADDA    $BA      TOP-LEFT VIDIO
00800          TFR     D,X
00810          LDB     X1
00820          LSRB
00830          LSRB
```

```
00840          LSRB
00850          ABX              BYTE LOCATION
00860 BIT      LDA      X1
00870          ANDA     #7      GET BETWEEN 0-7
00880          CLRB
00890          LDU      #$92DD  ROM OR TABLE
00900          RTS
00910 X1       RMB      1
00920 Y1       RMB      1
00930 X2       RMB      1
00940 Y2       RMB      1
00950 DX       RMB      1
00960 DY       RMB      1
00970 DCOUNT   RMB      1
00980 DIVSR    RMB      1
00990 COUNT    RMB      1
01000 SLOPE    RMB      1
01010          END      START
```

type in, but is worth the effort. The program can also be used as a driver for putting in your own coordinates. If you change the machine language program, be sure to get the new locations for `NP` (number of points), `NL` (number of lines), and `SHOW` (display address). When running `BASROTAT`, know that the program is computing 168 new points (56 coordinates times 3) and drawing 84 lines. With all of this background, see if you can write a program that does all of this in four dimensions.

Questions or comments concerning this tutorial may be directed to the author at Route 2, Box 216C, Mason, WI 54856-930. Please enclose an SASE when requesting a reply. ❑

Listing 2: `BINROTAT`

```
00050 TITLE    MACHINE LANGUAGE PROGRAM 2
00100          ORG      $6000
00110 POINT    RMB      2
00120 LINE     RMB      2
00130 NP       RMB      1
00140 NP1      RMB      1
00150 NL       RMB      1
00160 NL1      RMB      1
00170 X1       RMB      1
00180 Y1       RMB      1
00190 X2       RMB      1
00200 Y2       RMB      1
00210 DX       RMB      1
00220 DY       RMB      1
00230 DCOUNT   RMB      1
00240 DIVSR    RMB      1
00250 SCOUNT   RMB      1
00260 SLOPE    RMB      1
00270 FLAG     RMB      1
00280 SHOW     LDB      #4
00290          JSR      $9628
00300          LDB      #1
00310          JSR      $9653
00320          JSR      $9542
00330          LBSR     LINES
00340          LDB      #1
00350          JSR      $95AA
00360          LDB      #1
00370          JSR      $9682
00380          LDD      #$6700
00390          STD      POINT
00400          LDD      #$6500
00410          STD      LINE
00420          LDB      #$FF
00430          STB      >$B5
00440 WAIT     BSR      PICK
00450 PAGE5    LDB      #5
00460          JSR      $9653
00470          JSR      $9542
00480          BSR      PICK
00490          BSR      LOOP5
00500          LDB      #1
00510          JSR      $95AA
00520 PAGE1    LDB      #1
00530          JSR      $9653
00540          JSR      $9542
00550          BSR      PICK
00560          BSR      LOOP5
00570          LDB      #1
00580          JSR      $95AA
00590          BRA      PAGE5
00600 PICK     LDA      #$FE
00610          STA      $FF02
00620          LDA      $FF00
00630          CMPA     #$F7
00640          BEQ      XROTAT
00650          LDA      #$FD
00660          STA      $FF02
00670          LDA      $FF00
00680          CMPA     #$F7
00690          BEQ      YROTAT
00700          LDA      #$FB
00710          STA      $FF02
00720          LDA      $FF00
00730          CMPA     #$F7
00740          BEQ      ZROTAT
00750          LDA      #$FB
00760          STA      $FF02
00770          LDA      $FF00
00780          CMPA     #$BF
00790          BEQ      OVER
00800          BRA      PICK
00810 XROTAT   LDX      #$6702
00820          LDY      #$6704
00830          RTS
00840 YROTAT   LDX      #$6704
00850          LDY      #$6700
00860          RTS
00870 ZROTAT   LDX      #$6700
00880          LDY      #$6702
00890          RTS
00900 OVER     CLRB
00910          JSR      $95AA
00920          JMP      [$FFFE]
00930 LOOP5    LDU      #$7000
00940          LDB      NP
00950          STB      NP1
00960 LOOP3    LDD      ,X
00970          STD      ,U
00980          STD      4,U
00990          ASRA
01000          RORB
01010          ASRA
01020          RORB
01030          ASRA
01040          RORB
01050          ASRA
01060          RORB
01070          ASRA
01080          RORB
01090          ASRA
```

```
01100        RORB
01110        ASRA
01120        RORB
01130        STD    2,U
01140        LDD    ,U
01150        SUBD   2,U
01160        STD    ,U
01170        LDD    ,Y
01180        ASRA
01190        RORB
01200        ASRA
01210        RORB
01220        ASRA
01230        RORB
01240        STD    2,U
01250        LDD    ,U
01260        SUBD   2,U
01270        STD    ,X
01280 NEWY   LDD    ,Y
01290        STD    6,U
01300        STD    8,U
01310        LDD    4,U
01320        ASRA
01330        RORB
01340        ASRA
01350        RORB
01360        ASRA
01370        RORB
01380        STD    4,U
01390        LDD    8,U
01400        ASRA
01410        RORB
01420        ASRA
01430        RORB
01440        ASRA
01450        RORB
01460        ASRA
01470        RORB
01480        ASRA
01490        RORB
01500        ASRA
01510        RORB
01520        ASRA
01530        RORB
01540        STD    8,U
01550        LDD    6,U
01560        SUBD   8,U
01570        ADDD   4,U
01580        STD    ,Y
01590        LEAX   6,X
01600        LEAY   6,Y
01610        DEC    NP1
01620        LBNE   LOOP3
01630 LINES  LDU    #$6500
01640        SETDP  $60
01650        LDA    #$60
01660        TFR    A,DP
01670        LDB    NL
01680        STB    NL1
01690 LLOOP  LDX    #$6700
01700        LDD    ,U++
01710        LEAX   D,X
01720        LDA    #$80
01730        SUBA   4,X
01740        STA    DX
01750        LDB    ,X
01760        STB    DY
01770        LBSR   MULT
01780        ADDB   #128
01790        STB    X1
01800        LDB    2,X
01810        STB    DY
01820        LBSR   MULT
01830        LDA    #96
01840        PSHS   B
01850        SUBA   ,S+
```

```
01860        STA    Y1
01870        LDX    #$6700
01880        LDD    ,U++
01890        LEAX   D,X
01900        LDA    #$80
01910        SUBA   4,X
01920        STA    DX
01930        LDB    ,X
01940        STB    DY
01950        LBSR   MULT
01960        ADDB   #128
01970        STB    X2
01980        LDB    2,X
01990        STB    DY
02000        LBSR   MULT
02010        LDA    #96
02020        PSHS   B
02030        SUBA   ,S+
02040        STA    Y2
02050        PSHS   U
02060        LDA    X1
02070        CMPA   X2
02080        BLS    CONT1
02090        LDB    X2
02100        STA    X2
02110        STB    X1
02120        LDA    Y1
02130        LDB    Y2
02140        STA    Y2
02150        STB    Y1
02160 CONT1  LDA    X2
02170        SUBA   X1
02180        STA    DX
02190        LDB    Y2
02200        SUBB   Y1
02210        STB    DY
02220        LDA    Y1
02230        CMPA   Y2
02240        BLS    LINECD
02250 LINEAD NEG    DY
02260        LDA    DY
02270        CMPA   DX
02280        BHS    LINEB
02290 LINEA  LDA    DX
02300        INCA
02310        STA    DCOUNT
02320        LBSR   SLOPEA
02330 LOOPA4 PSHS   B
02340        LDB    ,X
02350        ORB    A,U
02360        STB    ,X
02370        PULS   B
02380        DEC    DCOUNT
02390        LBEQ   DONE
02400        INCA
02410        CMPA   #8
02420        BLO    LOOPA5
02430        CLRA
02440        LEAX   1,X
02450 LOOPA5 ADDB   SLOPE
02460        BCC    LOOPA4
02470        LEAX   -32,X
02480        BRA    LOOPA4
02490 LINEB  LDB    DY
02500        INCB
02510        STB    DCOUNT
02520        LBSR   SLOPEB
02530 LOOPB4 PSHS   B
02540        LDB    ,X
02550        ORB    A,U
02560        STB    ,X
02570        PULS   B
02580        DEC    DCOUNT
02590        BEQ    DONE
02600        LEAX   -32,X
02610        ADDB   SLOPE
```

```
02620        BCC    LOOPB4
02630        INCA
02640        CMPA   #8
02650        BLO    LOOPB4
02660        CLRA
02670        LEAX   1,X
02680        BRA    LOOPB4
02690 LINECD LDA    DY
02700        CMPA   DX
02710        BHS    LINED
02720 LINEC  LDA    DX
02730        INCA
02740        STA    DCOUNT
02750        BSR    SLOPEA
02760 LOOPC4 PSHS   B
02770        LDB    ,X
02780        ORB    A,U
02790        STB    ,X
02800        PULS   B
02810        DEC    DCOUNT
02820        BEQ    DONE
02830        INCA
02840        CMPA   #8
02850        BLO    LOOPC5
02860        CLRA
02870        LEAX   1,X
02880 LOOPC5 ADDB   SLOPE
02890        BCC    LOOPC4
02900        LEAX   32,X
02910        BRA    LOOPC4
02920 LINED  LDB    DY
02930        INCB
02940        STB    DCOUNT
02950        BSR    SLOPEB
02960 LOOPD4 PSHS   B
02970        LDB    ,X
02980        ORB    A,U
02990        STB    ,X
03000        PULS   B
03010        DEC    DCOUNT
03020        BEQ    DONE
03030        LEAX   32,X
03040        ADDB   SLOPE
03050        BCC    LOOPD4
03060        INCA
03070        CMPA   #8
03080        BLO    LOOPD4
03090        CLRA
03100        LEAX   1,X
03110        BRA    LOOPD4
03120 DONE   DEC    NL1
03130        PULS   U
03140        LBNE   LLOOP
03150        CLRA
03160        TFR    A,DP
03170        RTS
03180 SLOPEA LDA    DY
03190        LDB    DX
03200        BRA    CONT2
```

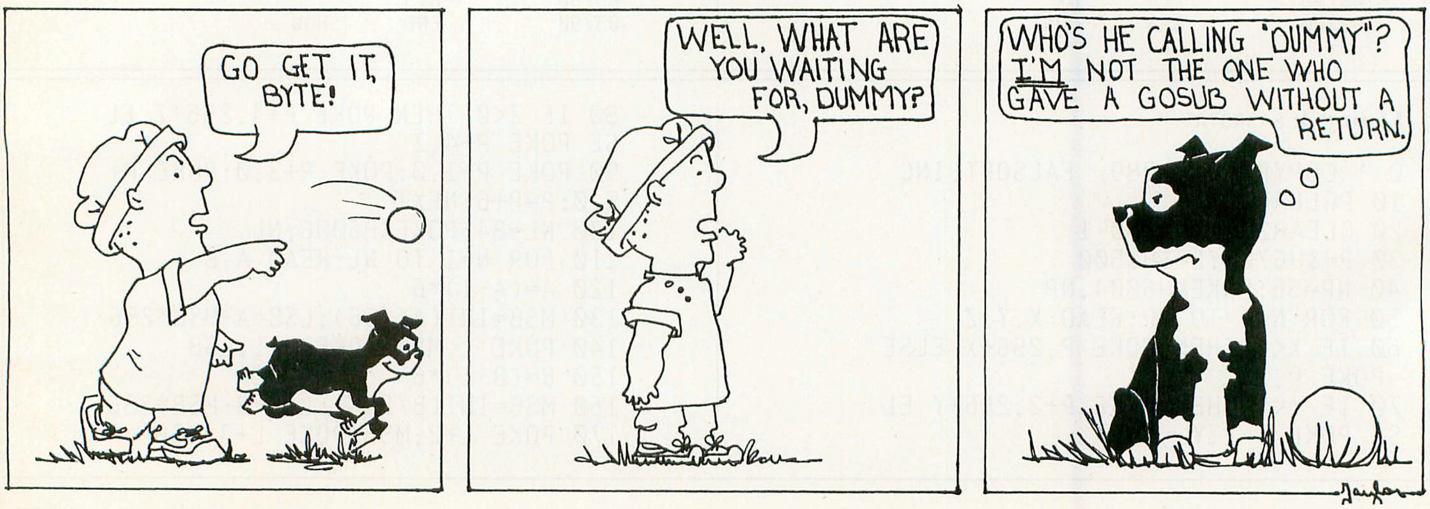
```
03210 SLOPEB LDA    DX
03220        LDB    DY
03230 CONT2  STB    DIVSR
03240        LDB    #8
03250        STB    SCOUNT
03260        CLRB
03270 SLOOP1 ASLB
03280        ROLA
03290        BCS    SLOOP2
03300        CMPA   DIVSR
03310        BLO    SLOOP3
03320 SLOOP2 SUBA   DIVSR
03330        INCB
03340 SLOOP3 DEC    SCOUNT
03350        BNE    SLOOP1
03360        STB    SLOPE
03370 BYTE   LDA    Y1
03380        LDB    #32
03390        MUL
03400        ADDA   >$BA
03410        TFR    D,X
03420        LDB    X1
03430        LSRB
03440        LSRB
03450        LSRB
03460        ABX
03470 BIT    LDA    X1
03480        ANDA   #7
03490        CLRB
03500        LDU    #$92DD
03510        RTS
03520 MULT   CLR    FLAG
03530        LDA    DX
03540        LDB    DY
03550        BPL    CMUL
03560        NEGB
03570        INC    FLAG
03580 CMUL   MUL
03590        TST    FLAG
03600        BEQ    DMUL
03610        NEGA
03620        NEGB
03630        SBCA   #0
03640 DMUL   ASRA
03650        RORB
03660        ASRA
03670        RORB
03680        ASRA
03690        RORB
03700        ASRA
03710        RORB
03720        ASRA
03730        RORB
03740        ASRA
03750        RORB
03760        ASRA
03770        RORB
03780        RTS
03790        END    SHOW
```

Listing 3: BASROTAT

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 PCLEAR8
20 CLEAR200,&H6000-1
30 P=&H6700:L=&H6500
40 NP=56:POKE&H6004,NP
50 FOR N=1 TO NP:READ X,Y,Z
60 IF X<0 THEN POKE P,256+X ELSE
 POKE P,X
70 IF Y<0 THEN POKE P+2,256+Y EL
SE POKE P+2,Y
80 IF Z<0 THEN POKE P+4,256+Z EL
SE POKE P+4,Z
90 POKE P+1,0:POKE P+3,0:POKE P+
5,0:P=P+6:NEXT
100 NL=84:POKE&H6006,NL
110 FOR N=1 TO NL:READ A,B
120 A=(A-1)*6
130 MSB=INT(A/256):LSB=A-MSB*256
140 POKE L,MSB:POKE L+1,LSB
150 B=(B-1)*6
160 MSB=INT(B/256):LSB=B-MSB*256
170 POKE L+2,MSB:POKE L+3,LSB
```

```
180 L=L+4:NEXT
190 EXEC&H6013
200 DATA -20,40,-40
210 DATA 20,40,-40
220 DATA 20,20,-40
230 DATA 40,20,-40
240 DATA 40,-20,-40
250 DATA 20,-20,-40
260 DATA 20,-40,-40
270 DATA -20,-40,-40
280 DATA -20,-20,-40
290 DATA -40,-20,-40
300 DATA -40,20,-40
310 DATA -20,20,-40
320 DATA 40,40,-20
330 DATA 40,40,20
340 DATA 40,20,20
350 DATA 40,20,40
360 DATA 40,-20,40
370 DATA 40,-20,20
380 DATA 40,-40,20
390 DATA 40,-40,-20
400 DATA 40,-20,-20
410 DATA 40,20,-20
420 DATA -20,40,40
430 DATA 20,40,40
440 DATA 20,40,20
450 DATA 20,40,-20
460 DATA -20,40,-20
470 DATA -40,40,-20
480 DATA -40,40,20
490 DATA -20,40,20
500 DATA -20,-40,40
510 DATA 20,-40,40
520 DATA 20,-40,20
530 DATA 20,-40,-20
540 DATA -20,-40,-20
550 DATA -40,-40,-20
560 DATA -40,-40,20
570 DATA -20,-40,20
580 DATA 20,20,40
590 DATA 20,-20,40
600 DATA -20,-20,40
610 DATA -40,-20,40
620 DATA -40,20,40
630 DATA -20,20,40
640 DATA -40,20,20
650 DATA -40,-20,20
660 DATA -40,-20,-20
670 DATA -40,20,-20
680 DATA -20,20,-20
690 DATA 20,20,-20
700 DATA 20,-20,-20
710 DATA -20,-20,-20
720 DATA -20,20,20
730 DATA 20,20,20
740 DATA 20,-20,20
750 DATA -20,-20,20
760 DATA 1,2,2,3,3,4,4,5,5,6,6,7
,7,8,8,9,9,10,10,11,11,12,12,1
770 DATA 13,14,14,15,15,16,16,17
,17,18,18,19,19,20,20,21,21,5,4,
22,22,13
780 DATA 23,24,24,25,25,14,13,26
,26,2,1,27,27,28,28,29,29,30,30,
23
790 DATA 31,32,32,33,33,19,20,34
,34,7,8,35,35,36,36,37,37,38,38,
31
800 DATA 24,39,39,16,17,40,40,32
,31,41,41,42,42,43,43,44,44,23
810 DATA 29,45,45,43,42,46,46,37
,36,47,47,10,11,48,48,28
820 DATA 27,49,48,49,12,49,26,50
,22,50,3,50,21,51,34,51,6,51,47,
52,9,52,35,52
830 DATA 30,53,44,53,45,53,25,54
,39,54,15,54,40,55,18,55,33,55,4
1,56,46,56,38,56
```

Dr. Nibble


GO GET IT, BYTE!
WELL, WHAT ARE YOU WAITING FOR, DUMMY?
WHO'S HE CALLING "DUMMY"? I'M NOT THE ONE WHO GAVE A GOSUB WITHOUT A RETURN.
Jaylor

Delphi Bureau

A shareware terminal program just for game-playing

Come and Get It!

By Don Hutchison
CoCo SIG Staff Engineer

Attention, Delphi game players! In a cooperative venture, Rick Adams (RICKADAMS) and Delphi have developed a CoCo terminal program just for game-playing. It's called *GameTerm*, and it's yours for the downloading from the database of the CoCo SIG.

GameTerm is not public domain software nor is it for sale. It is not a full-fledged terminal program either, but it *is* a lot of fun to play with. Do anything you want with it, but further distribution must be free and all copyright notices remain as is.

GameTerm is designed to work on the CoCo 1, 2 or 3 and requires an RS-232 pak or third party equivalent. It can be easily modified to work on cassette systems. *GameTerm* doesn't require a monitor, so it can be used with a TV set as a display device. The display is 32 columns of upper-/lower-case text on a two-color screen. (Foreground and background colors are selectable on a CoCo 3.) The program is designed to function at 300 or 1200 baud.

Enter `DA TEL` at the CoCo SIG prompt to get to the Telecommunications topic of the database, then type `READ GAMETERM` to get to the files you'll need. Just as with *DELPHI*term, a BASIC and binary program are used so users may customize the program to their individual tastes. Just download `GAMETERM.BAS` and `GAMETERM.BIN` for the terminal program itself, although you'll probably want to download the documentation file, too. (It's called `GAMETERM.DOC` in the database.) For advanced hackers, Rick has very graciously provided the source code.

Using *GameTerm*

GameTerm imitates a terminal program until it detects a Delphi *Scramble* game, at which time it enters its scramble mode when Delphi outputs the first *Scramble* board. *GameTerm* responds by reconfiguring the screen to show three windows: one window shows the *Scramble* board and is updated every time you press ENTER to insert a blank line; another window shows valid word entries entered (one word per line); and a third window shows your typing and "chit-chat" during the game.

GameTerm works much the same way when playing Delphi's *FlipIt!* game. Entering this game automatically triggers the *FlipIt!* mode. In this mode the game board is updated automatically during play in the top window. Use your (low-resolution) joystick or mouse to point to the next move, and click to enter. The lower window shows "chitchat" during the game.

Future versions of *GameTerm* will include support for Delphi's newest game, *Poker Showdown*. Sorry, *Poker Showdown* was put online just as *GameTerm* was being uploaded. Rick says, "Give me time."

GameTerm also features a very interesting "doodle" mode, while a user is in Delphi conference. Special ASCII sequences are interpreted as *GameTerm* "doodle" commands. The first command causes *GameTerm* to split the screen into two windows. The top one is used as an artist's scratchpad for "doodle" commands that specify lines, pixels and alpha characters to be drawn. With the proper commands, one can draw pictures on the screens of everyone in conference who is using *GameTerm*. The commands are meaningless to those without the program, so it's advisable for users to gang up only in their own conference for this kind of stuff.

Terminal Programs

While there are many good terminal programs for the Color Computer advertised in RAINBOW, we also have three great

---

Don Hutchison works in Birmingham, Alabama, as a senior project engineer involved in the design of industrial controls systems. His Delphi username is DONHUTCHISON.

Database Report

By Gregory A. Law
CoCo SIG Database Manager

In the general topic area **Kevin Leger** (KEVINLEGER) uploaded "Using a Monochrome on CoCo 3", an article which includes a simple BASIC program addressing the problem of 80-column text with a monochrome monitor. **Brian White** (BRIANWHITE) uploaded *Max-10* documentation written by the author of *Max-10*, giving detailed information left out by Colorware. **Fred McDonald** (FREDMCD) gives us a somewhat humorous directory he discovered on one of his disks. **Marty Goodman** (MARTYGOODMAN) uploaded an essay titled "A Possible Aids Cure.'' **Chris Burk** (COCOXT) uploaded a patch to *Hyper-I/O* Version 2.6a to fix a sticky FAT problem. **Bill Moyer** (WILLUM) provided us with a BASIC program that patches *DeskMate* to run the printer at 2400 baud.

In the CoCo 3 Graphics topic of the database, **Richard Trasborg** (TRAS) uploaded 640 picture format utilities to convert C-See graphics images to *Color Max* format and a set of G-rated images showing an animated girl exercising in each. **Randy Cassell** (BBTROLL) uploaded a digitized image of Fred Savage from *The Wonder Years*. **Andy Duplay** (KB8BMN) uploaded a monochrome GIF image of Vanna White. **Joe M. Villarreal** (VILLARREAL) uploaded a 320-by-200 16-color picture of Roger Rabbit in *Color Max 3* format. **Pete Ellison** (PETEELLISON) uploaded a description of the features available in the Rascan video digitizer, ones in the CoCo SIG's database. I'm referring to *Mikeyterm*, *Greg-E-Term* and *DELPHIterm*. All three are *shareware* and can be downloaded from our database or obtained directly from the authors.

This does not mean they are public domain; they are not. All three are copyrighted programs. While the authors allow them to be copied freely and posted on networks and bulletin boards, you should support the authors with a donation if you continue to use the program. That's simply the way shareware works.

Mikeyterm and *Greg-E-Term* work on the CoCo 1, 2 or 3. *DELPHIterm* works only on a CoCo 3, and supports either the RS-232 pak or the serial port. *Greg-E-Term* operates at 300, 1200 or 2400 baud through the bitbanger port or an optional RS-232 pak. *Mikeyterm* functions at 300 baud, only through the serial port, yet will operate at 300, 1200 or 2400 baud if you're using an RS-232 pak.

All three programs feature an error-detecting protocol for file transfers. While *Mikeyterm* supports X-modem protocol, *Greg-E-Term* Version 2.5 and *DELPHIterm* support the popular Y-modem protocol. Using Y-modem may result in shorter file transfer times for you.

While *DELPHIterm* and *Mikeyterm* download into a buffer area, *Greg-E-Term* features direct-to-disk downloading, which may be advantageous for downloading files larger than the available buffer area. This means that *Greg-E-Term* is capable of downloading files up to about 155,000 bytes (the capacity of a standard CoCo disk), while *DELPHIterm* and *Mikeyterm* are limited to files of about 40,000 or so bytes.

It's impossible to say which terminal program is right for you. All we can suggest is that you download (or read online) the documentation file for each program and compare each program for the features you desire. After that, either download the terminal program or order it directly from the author. Ten dollars is not a lot to spend for any of these terminal programs, and you simply can't go wrong by ordering all of them.

For *Mikeyterm*, send $10 to:
Mike Ward
1807 Cortez
Coral Gables, FL 33134

For *Greg-E-Term*, send $10 to:
Greg Miller
9575 Royston Road
Grand Ledge, MI 48837

For *DELPHIterm*, send $10 to:
Rick Adams
Color Central Software
712 Brett Avenue
Rohnert Park, CA 94928

featuring colorized video images and a brief description of the Rascan video digitizer, and Rascan spinning coin animation displaying a spinning coin. **John Malon** (JOHNLM) uploaded a GIF image of women wearing sunglasses. **Dennis L. Wood** (DLWOOD) uploaded BIG TEN.CM3, commemorating the 1989 Big Ten basketball champ's achievements. **Tim Jones** (TIMJONES) uploaded a Mickey Mouse picture in *Color Max 3* format and a picture of a dinosaur. **Luis Martinez** (LUMA) uploaded a picture of a 1938 Lasalle saved in *CoCo Max 3* format and *Funny Graph*, courtesy of the Puerto Rico Color Computer Club. **Ken Schunk** (KENSCHUNK) uploaded a new and improved MGE viewer for IBM clones with an EGA or VGA card and a new and improved DS-69 viewer for IBM clones with an EGA or VGA card. **Robert Wilson** (COCOTIGER) uploaded pictures of Merlin, a wizard and an alien saved in *CoCo Max 3* format and a picture of a dragon in *CoCo Max 3* format. **Dennis Zobel** (DZ) uploaded a picture of a covered bridge in *Rat* format created by Gian Polizzi.

In the Source for 6809 Assemblers topic of the database, **Randall Reid** (RANDOMR) uploaded an article that gives some key entry points for disk functions in Disk BASIC. **Don Hutchison** (DONHUTCHISON) uploaded NUTRAX to format tracks 35 through 39 for those that have upgraded to 40-track disks.

In the Utilities and Applications topic of the database, Randy Cassell uploaded a program to keep track of up to 25 player statistics for baseball and softball teams; a program written originally to keep track of a local junior basketball leagues fund raiser; and a program to track a Sub Sale for little league teams consisting of up to 20 teams with 15 players each. **Ken Halter** (KENHALTER) uploaded a program for calculating a CRC value for any file you specify; a program to calculate information on a right triangle; and a program to print 32-, 40- and 80-column layout sheets used to design menus and other screen images. John Malon uploaded a utility to transfer a ROM Pak to disk and a RAM Disk program for the 128K and 512K CoCo 3. **Matthew Hunt** (MATTHEWHUNT) uploaded a CoCo 3 program for graphing mathematical equations including lines, parabolas, hyperbolas, circles, ellipses and trig functions over virtually any range and includes a printer screen dump. **Ronald Zborowski** (BIGZ) uploaded ROMMOVER.BAS to copy 16K and 32K ROM Paks to disk and requires a CoCo 3 and Multi-Pak interface. **Steve Bjork** (6809ER) uploaded a file titled KILLSND.BIN to create anonymous sounds everytime you delete a file. You must download it to discover what sound it uses. Don Hutchison uploaded NUTRAX.BIN that formats tracks 35 through 39 for those who have just purchased 40-track drives. **Don Jere** (DONJERE) uploaded an improved version of his financial calculator, featuring better screen formatting and more pleasing colors than the previous version. **Alan Dekok** (ALANDEKOK) uploaded a set of files allowing you to use DSKINI without clobbering everything in memory for both Disk BASIC 1.0 and 1.1. NV7L uploaded a Bible reading program for generating one-page personalized printouts, giving a scripture reading for each day of the year. **Bruce Bell** (BRUCEBELL) uploaded a utility presenting all 64-foreground and -background color combinations in the current palette and allows you to change the colors with the arrow keys.

In the Hardware Hacking topic of the database, **Ken Johnston** (KENJOHNSTON) uploaded a detailed list of the CoCo 3 registers and their meanings.

In the Games topic, Ronald Zborowski uploaded a program to load *Rad Warrior*, *Silpheed* and *Pitfall* from disk and run them in RAM. (Useful for those who have transferred these games to disk.) **Jim Rix** (JIMRIX) uploaded a program that allows players of *Advanced Dungeons and Dragons* to generate the

(Rick also includes a copy of *GameTerm*, too!)

Rick Adams (RICKADAMS) and Mike Ward (MIKEWARD) are online on Delphi almost every night and are available to answer any questions you might have about their programs and/or telecommunications.

New Database Submission Procedure

The way you submit files for inclusion in the database has been changed. It is no longer necessary to request a free uploading appointment from us. You may now upload at your own convenience and you're not billed for time spent using the new Submit procedure. You also don't need to upload the files to your workspace first, since you may now upload the files from within the Submit procedure. The net result is a procedure that's much easier to use.

For now, you may continue to use the old Submit procedure when you first request free time, then upload the files to your workspace and submit them to the database. However, this procedure will be discontinued in a few months.

To use the new procedure, simply type the Submit command from the database prompt and choose "New" at the menu. While it may seem a little intimidating at first, just consider the whole process as a form to be filled out, and consider each menu item as one blank on the form. Just choose an item and then answer the question.

If you've been putting off uploading that new program or picture because you weren't sure how to do it, it's now a whole lot easier!

Storage Charges

Just a short reminder that Delphi users are charged for disk space for the files which they keep in their workspaces. Monthly storage charges are as follows: The first 25,600 characters (50 blocks) are provided at no additional charge with your Delphi membership. Each additional 1024 characters (two blocks) costs 16 cents per month. (One block equals 512 characters.) Now might be the time for some housecleaning if you've allowed your workspace to get full of little-used files.

For database uploaders, storage space might be charged to you if you don't delete the files after you submit them to the SIG. The Submit process makes it very easy to delete the files from your workspace by asking you if you want the files deleted. So, to avoid unnecessary charges to your account, remember to delete the uploads from your workspace after submitting them to the SIG for publication.

These charges are explained in the Delphi manual and online at the main menu. To review the rates, just enter `USING DELPHI RATES` at the main menu. ❑

values of gems, jewelry, monster hit points and statistics of the characters.

In the Telecommunications topic of the database, **Rick Adams** (RICKADAMS) uploaded *GameTerm* to provide a graphics interface on Delphi. It supports *Scramble*, *FlipIt!* and a unique realtime conferencing "doodle" mode is provided.

OS-9 Online

In the General Information topic, **Karl Quinn** (QKQ) uploaded a review of the new VED text editor. **Mike Stute** (GRIDBUG) uploaded news of the latest virus that attacked various systems. **Bob Montowski** (GRAPHICSPUB) uploaded a solution to *Leisure Suit Larry in the Land of the Lounge Lizards*.

In the Applications topic of the database, **Jeff Blower** (SEBJMB) uploaded a file containing the executable source code for some predefined window creation commands. **Michael Weigel** (MAREK) uploaded *Shell+* Version 2.1, written by Ron Lammardo, featuring wildcards. **Dick White** (DICKWHITE) uploaded the template to Form 1040 for the year 1988, with Forms A and B. **Steve Clark** (STEVECLARK) uploaded a file consisting of various shell scripts for *Shell+*, including `backhd`, `ccs`, `ccg`, `qman`, `ff`, `tshare` and `procmon` and a *dBASE III+* data utility, allowing you to read, display and print *dBASE III+* and *FoxBase+*database (`.DBF`) files under OS-9. **David Cook** (DCOOK) uploaded a cash register program that automatically calculates tax.

In the Utilities topic of the database, **Tracy L. Skaggs** (ATRDES) uploaded a short program that runs *Home Publisher* under *Multi-Vue*. **Zack Sessions** (ZACKSESSIONS) uploaded a file to replace a previous upload and `AIF` and Icon files to run *Sub Battle*, *Microscopic Mission*, *Kings Quest 3*, and *Flight Sim II* under *Mutli-Vue*. **Alan Sheltra** (PHDRAGON) uploaded a utility that takes the current window's attributes, such as the window type, size and palettes, and allows you to create any type window, a simple phone file database and autodialer titled `PF.AR`, and Version 2 of his phone dialer, which adds a search routine and a simple notepad editor titled `PFV2.AR`. Jeff Blower uploaded a utility to selectively delete files from a user specified directory and requires *DLS Directory* also in the database, and a utility to quickly and easily change directories in OS-9 titled `SETD`. **Newton White** (PERFUMER) uploaded `REWRITE.PAK`, which transfers a complete disk over the modem. **Jim Hollier** (PGJIM) uploaded a sample file management utility. **Colin McKay** (COLINMCKAY) uploaded `CM32VEF` for converting *CoCo Max 3* graphics files to VEF format, a program that converts files between VEF and *CoCo Max*, and a BASIC09 program, displaying the sector allocation map on your disk drives titled `DAM.AR`. **Roger Bouchard** (HARDWAREHACK) uploaded the source and executable files for a utility that sets the date and time from either the RGB or Disto real-time clocks and allows you to set the date and time in the real-time clock. **Warren Moore** (WJMOORE) uploaded `GETSIZE` written in BASIC09 to display the size of any type of file. **Jim Smith** (JWSMITH) uploaded `MOUSE.AR` that changes the system defaults for the mouse or joystick and `TYPE.AR`, a utility for creating the window type specified and executing a program on that window. **Mike Woolley** (WOOLLEY) uploaded a program that converts numbers to their decimal, hexadecimal, binary, octal or Roman numerals.

In the Device Drivers topic of the database, Chris Burke uploaded an *EzGen* patch file to fix bugs in Version 2.4 of `BBFHDISK.DR`, in which the cache is not flushed after a Read error and the format routine hangs on certain hardware errors. **Duane Penzien** (DUANO) uploaded a device driver and descriptor for the `MC6850 ACIA` with hardware polling for OS-9 Level I.

In the Patches topic of the database, Zack Sessions uploaded patches to allow *Microscopic Mission* to run from a window other than `/TERM`, originally written by Ron Lammardo. **Mike Huskey** (KINGTRENT) uploaded a patch for `SETIME` that uses the format MM/DD/YY instead of YY/MM/DD. **Kenneth Tipper** (ATUC) uploaded a program that tailors `TSSpell` and `TSSpellw` for the user defined paths to the dictionary and to allow more control over the sharing of personal dictionaries. **Dennis Skala** (DENNYSKALA) uploaded `BBCLOCK1.AR` to make the standard Level II clock module directly access the Burke & Burke hardware clock, which results in more accurate timekeeping. **Mike Sweet** (DODGECOLT) uploaded details of how to make an OS-9 boot ROM. Roger Bouchard uploaded `VED V1.5`, a `MODPATCH` file to fix two bugs in the VED editor.

In the Telecom topic of the database, **Philip Brown** (THEFERRET) uploaded a simple terminal program with X-modem file transfers. **D. Philipsen** (DPHILIPSEN) uploaded the latest version of *SuperComm*, which supports `ANSI` and OS-9 terminal emulation, X-modem and Y-modem file transfers and an auto-dialer titled *Supercomm* Ver 1.12. Jim Smith uploaded a time-sharing monitor for detecting the baud rate of the caller.

In the Graphics and Music topic of the database, Jeff Blower uploaded a utility that works with `VEFIO` and `DLS` to simplify viewing graphics pictures in VEF format. **Mark O'Pella** (MDODELPHI) uploaded the theme from *Cheers* and *Hello* by Lionel Ritchie for *Ultimuse*. **Bruce Isted** (BRUCEISTED) uploaded a program for printing VEF pictures to C. Itoh, Tandy, Epson, Gemini, IBM and Star Micronics printers. Steve Clark uploaded a program for running slide shows of graphics files and works with `MACSHOW`, `RLE`, `VEFIO`, `GIFOS9`, and other graphics viewers. **Kevin Darling** (KDARLING) uploaded a utility that plays Amiga and Macintosh sound files under OS-9 and a program that loads a VEF picture and then saves any portion of it as a `GET/PUT` buffer. **Michael Schneider** (MSCHNEIDER) uploaded several Macintosh sound files saying "You're no Jack Kennedy", Robin Williams saying "Good Morning Vietnam!", the breaking glass sound effect as heard on *Late Night with David Letterman*, thirteen sound files from *Star Trek*, two sound files from the movie *Attack of the Killer Bimbos*, "Badges, we don't need no stinkin' badges", and the well-known saying from *Mission Impossible* "This disk will self-destruct in five seconds". **Mike Knudsen** (RAGTIMER) uploaded the latest version of *Ultimuse*, a nice graphics music editor and synthesizer sequencer. (Requires a MIDI capable synthesizer to use.) **Bob Montowski** (GRAPHICSPUB) uploaded sound files of Sam Kinison and VEF pics of President Reagan, Catherine Deneuve and others. **Glen Hathaway** (HATHAWAY) uploaded *Mona Lisas and Mad Hatters* (Part 2) by Elton John for *Ultimuse*. **Jim Buck** (COCOROGUE) uploaded *If You Love Me (Let Me Know)* by John Rostill for *Ultimuse*, and sound files of the last space shuttle mission. **Kris Rehberg** (KRISREHBERG) uploaded a utility to play *Musica* files. Zack Sessions uploaded `CARMEN` under *Multi-Vue* for running *Where in the World is Carmen Sandiego?* with *Multi-Vue*.

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If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, and don't forget this is* BASIC. *All programs resulting from your wishes are for your use, but remain the property of the author.*

Getting a piece of the pie

Getting the Whole Picture on Fractions

By Fred B. Scerbo
Rainbow Contributing Editor

The mail and phone calls received in recent weeks have been most supportive of our recent educational programs designed to help young students. With those suggestions in mind for this month, and upcoming months, we will examine a new program on visualizing fractions.

Fractions are both abstract and concrete mathematical concepts. Teaching a youngster these concepts can be very difficult if we use only number representations.

Many years ago in grammar school, we learned fractions with the ole' cardboard slices from an "apple pie." By rearranging and actually handling the slices, we were able to make an abstract concept more concrete.

Today I find some of my own students having trouble understanding that the fraction one-eighth means that the whole is divided into eight equal parts, of which only one part remains. Again, literally seeing this relationship makes understanding easier. But instead of cardboard cutouts, I have chosen to use the CoCo.

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

Fractions1 is a program designed to aid students in visualizing this math concept. Using the screen structure developed for *Opposite Concepts* and other recent programs, I took fractions from one whole through one-ninth and displayed them in an easy-to-use reviewable format.

Some readers recently asked why I continue to write these programs in black and white, when color seems so much more effective. First of all, using the `PMODE0` screen allows more use of limited memory in BASIC. Secondly, since only one graphics page is used, the speed of execution is more rapid using a smaller amount of memory in the graphics mode. Finally, incorporating color into these drawings would make the program more difficult to write and execute.

Presently the strings that draw the graphics in this and other recent programs contain all the information needed to create the image. This program, *Fractions1*, is the first to even incorporate a `PAINT` statement.

Since using the `PAINT` statement adds extra steps to each drawing command and requires coordinates for the painting, I chose not to use it. The more complex the drawing, the more `PAINT` statements it might need. One drawing may only require one, while another requires five or six, making the program too complicated. (Remember, I am trying to show you easy routes in using BASIC.)

Using color also makes inverting the screen more difficult, and since one drawing is always in the negative, it would defeat the whole purpose of having color.

Another major reason for sticking with black and white is that it helps keep the student's attention focused on the task by presenting less distraction. In addition, the program is useful on a black and white as well as a color TV.

Using the Program

While running the program, proceed to the menu after the title card by pressing ENTER.

Pressing A allows you to review all the fractions one at a time, written with a graphics representation. Advance to each one by pressing ENTER. The displayed image allows the student to point out and count the pieces on the screen.

Section B, the graphics quiz, works like all other graphics quizzes. The numerical expression of the fraction appears in the upper left part of the screen as a negative image while three choices appear in the remaining corners.

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And don't forget, we also offer other goodies for the music lover. Such as Lyra, the graphics music editor, CoCo MIDI 3, the MIDI recorder, and much more! Give us a call... you'll be glad you did.

Pressing the space bar moves the flashing cursor. Simply press ENTER when you have the correct match,press the @ key to check your score, and press C to continue. This returns you to the position from which you stopped.

The written quiz works the same as other written quizzes. You must match the numeric fraction with its written version. Press the @ key and continue to work the same way on this quiz.

One of our next steps is showing which fractions are equal to others, such as 1/2 = 2/4. This important skill can be reinforced by using this screen setup.

If you have any suggestions about other skills that could be represented with this graphics screen format, drop me a line and I'll see what I can come up with. Until then, see you next month. ☐

50	127	500	209
100	174	565	41
180	9	650	69
275	113	740	104
360	27	END	176
420	217		

The listing: FRACTION

```
1 REM****************************
2 REM* VISUALIZING FRACTIONS 1 *
3 REM*   COPYRIGHT (C) 1989    *
4 REM*    BY FRED B. SCERBO    *
5 REM*    60 HARDING AVENUE    *
6 REM*  NORTH ADAMS, MA 01247  *
7 REM****************************
10 CLEAR3000
15 CLS0:PRINTSTRING$(32,188);STR
ING$(32,204);:FORI=1TO 224 :READ
 A:PRINTCHR$(A+128);:NEXT
20 DATA29,28,28,26,30,28,29,21,2
8,29,21,28,29,21,28,30,29,20,30,
21,28,29,20,30,18,29,24,30,29,84
,93,92
25 DATA21,,,24,26,,21,21,,21,21,
,20,20,,26,20,,26,21,,21,,26,26,
21,,26,,,85,
30 DATA21,,,18,26,,21,21,16,21,2
1,,,,,26,,,26,21,,21,,26,21,21,,
26,,,85,
35 DATA21,28,28,26,30,29,28,21,2
8,29,21,,,,,26,,,26,21,,21,,26,2
0,23,,28,29,,85,
40 DATA21,,,,26,21,,21,,21,21,,,
,,26,,,26,21,,21,,26,,31,,,21,,8
5,
45 DATA21,,,,26,20,26,21,,21,21,
,21,,,26,,,26,21,,21,,26,,21,,18
,21,,85,
50 DATA28,24,,20,28,,28,20,,20,2
0,28,28,,20,28,,20,28,20,28,28,2
0,28,,28,24,28,28,84,92,92
55 PRINTSTRING$(32,195);STRING$(
32,179);
60 PRINT@388," VISUALIZING FRACT
IONS 1 “;
65 PRINT@420,"    BY FRED B.SCER
BO      “;:PRINT@452,"    COPYRIGH
T (C) 1989      “;
70 X$=INKEY$:IFX$<>CHR$(13)THEN7
0
75 DIM P$(9,2),A$(6),B$(9),C$(9)
,A(9),N(9),B(4),C(4),D(4),E(4),F
(4),AO(9)
80 FORI=1TO3:READ C(I),D(I),E(I)
,F(I):NEXT:FORI=1TO6:READA$(I):N
EXT:READ O$:FORI=1TO9:READP$(I,1
),B$(I),P$(I,2),C$(I):NEXT
85 COLOR1,0:FORI=1TO9:P$(I,1)=O$
+P$(I,1):NEXTI
90 REM TITLE
95 CLS:PRINTSTRING$(64,"=");:PRI
NT@68,"VISUALIZING FRACTIONS 1":
PRINTSTRING$(64,"=");:PRINT@198,
“A) REVIEW FRACTIONS":PRINT@262,
“B) QUIZ GRAPHICS":PRINT@326,"C)
 WRITTEN QUIZ"
100 PRINT@388,"<<<SELECT YOUR CH
OICE>>>"
105 PRINT:PRINTSTRING$(32,"=");
110 X$=INKEY$:X=RND(-TIMER):IFX$
="A"THEN395ELSEIFX$="B"THEN115EL
SEIFX$="C"THEN615ELSE110
115 CLS0:PMODE0,1:PCLS1
120 LINE(0,0)-(254,170),PRESET,B
125 LINE(6,4)-(122,82),PRESET,BF
130 LINE(128,4)-(248,82),PRESET,
B
135 LINE(6,86)-(122,164),PRESET,
B
140 LINE(128,86)-(248,164),PRESE
T,B
145 DRAW"BM26,188C0NU10R10NU10BR
6R10U6L10U4R10BR6NR10D4NR10D6R10
BR12BU6NE4D2F4BR6R10U6L10U4R10BR
6ND10R10D4NL10BR6NR10D6U10R10D10
BR6NR10U10R10BR6NR10D4NR10D6R10B
R10U10NL4R10D4NL10D6NL14BR6U10R1
0D4NL10D6BR6U10R10D4L10R4F6BR6E4
U2H4"
150 DATA130,6,246,80,6,86,120,16
2,130,86,246,162
155 PAINT(2,2),0,0:PCOPY1TO3
160 PMODE0,4:PCLS1
165 LINE(0,0)-(254,170),PRESET,B
F
170 LINE(8,6)-(120,80),PSET,BF
175 PCOPY4TO2:PMODE0,1:SCREEN1,1
180 DATA"BM2,8C1","BM130,8C0","B
M2,90C0","BM130,90C0","BM2,48C0"
,"BM130,48C0"
185 FORI=1TO9
190 A(I)=RND(9):IFN(A(I))=1THEN1
90
```

```
195 N(A(I))=1:NEXTI:FORY=1TO9:CO
LOR1,0
200 FORI=2TO4
205 B(I)=RND(3)+1:IFN(B(I))=0THE
N205
210 N(B(I))=0:NEXTI:FORI=1TO4:N(
I)=1:NEXT
215 B=RND(9):IFB=A((Y))THEN215
220 C=RND(9):IFC=B OR C=A((Y))TH
EN220
225 DRAW A$(1):DRAWP$(A(Y),1)
230 DRAW A$(B(2)):DRAWP$(B,2)
235 DRAW A$(B(3)):DRAWP$(C,2)
240 DRAW A$(B(4)):DRAWP$(A(Y),2)
245 CIRCLE(188,42),34,0,.9:PAINT
(170,40),0,0
250 CIRCLE(60,124),34,0,.9:PAINT
(42,122),0,0
255 CIRCLE(188,124),34,0,.9:PAIN
T(170,122),0,0
260 COLOR1,0
265 Z=0
270 PMODE0,4
275 DRAW A$(1)+"C0":DRAWP$(A(Y),
1)
280 DRAW A$(B(2))+"C1":DRAWP$(B,
2)
285 DRAW A$(B(3))+"C1":DRAWP$(C,
2)
290 DRAW A$(B(4))+"C1":DRAWP$(A(
Y),2)
295 CIRCLE(188,42),34,1,.9:PAINT
(170,40),1,1
300 CIRCLE(60,124),34,1,.9:PAINT
(42,122),1,1
305 CIRCLE(188,124),34,1,.9:PAIN
T(170,122),1,1
310 PMODE0,1:SCREEN1,1
315 LINE(8,6)-(120,80),PSET,B
320 X$=INKEY$:IFX$=" "THEN330ELS
EIFX$="@"THEN785
325 COLOR1,0:LINE(8,6)-(120,80),
PRESET,B:GOTO315
330 Z=Z+1:IFZ=4THENZ=1
335 COLOR1,0:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PSET,B
340 X$=INKEY$:IFX$=" "THEN330ELS
EIFX$=CHR$(13)THEN350ELSEIFX$="@
"THEN785
345 COLOR1,0:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PRESET,B:GOTO335
350 IFZ+1=B(4)THEN360
355 NW=NW+1:FORK=1TO5:PMODE0,4:S
CREEN1,1:SOUND10,3:PMODE0,1:SCRE
EN1,1:SOUND1,3:NEXTK:GOTO335
360 NC=NC+1:PMODE0,4:PCLS1:LINE(
```

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```
0,40)-(256,126),PRESET,B:LINE(6,
44)-(124,122),PRESET,B:LINE(130,
44)-(248,122),PRESET,B:PAINT(2,4
2),0,0
365 DRAW A$(5):DRAWP$(A(Y),1)
370 DRAW A$(6):DRAWP$(A(Y),2):CI
RCLE(188,82),34,0,.9:PAINT(170,8
0),0,0
375 SCREEN1,1
380 X$=INKEY$:IFX$<>CHR$(13)THEN
380
385 PMODE0,1
390 PCOPY3TO1:SCREEN1,1:PCOPY2TO
4:NEXTY:GOTO785
395 PMODE0,2:PCLS1:SCREEN1,1:LIN
E(0,40)-(256,126),PRESET,B:LINE(
6,44)-(124,122),PRESET,B:LINE(13
0,44)-(248,122),PRESET,B:PAINT(2
,42),0,0
400 FORI=1TO9:DRAW A$(5):DRAWP$(
I,1)
405 CIRCLE(188,82),34,0,.9
410 DRAW A$(6):DRAWP$(I,2):PAINT
(170,80),0,0
415 X$=INKEY$:IFX$<>CHR$(13)THEN
415
420 COLOR1,0:LINE(8,46)-(122,120
),PSET,BF:LINE(132,46)-(246,120)
,PSET,BF:NEXTI
425 RUN
430 DATA”BR30BD20D10R10U10NL10BR
6ND10F10NU10BR6NR6U6NR6U4R6"
435 DATA”BL52BD18D10R6NU10R6U10B
R6D10U6R8U4D10BR6U10R8D10NL8BR6N
U10R6BR6NR8U6NR8U4R8BR16BD4R8L4U
20G2"
440 DATA ONE WHOLE
445 DATA”BR”
450 DATA “1”
455 DATA”BL44BD18D10U6R8NU4D6BR6
U10R8D4NL8D6BR6NU10R8BR6U6NR8U4R
8BR18BD6NR8U4R8U4L8BU4L2R12L6BU4
U8"
460 DATA ONE HALF
465 DATA “BR58BD34NU28ND28
470 DATA “1/2”
475 DATA”BL48BD18R4ND10R4BR6D10U
6R8U4D10BR6U10BR6ND10R8D4L6F6BR6
R2NU10R8U10NL10BR18BD6R8U4NL8U4L
8BU4L2R12L6BU4U8"
480 DATA ONE THIRD
485 DATA “BR58BD34NU28M-26,+15M+
26,-15M+26,+15"
490 DATA “1/3”
495 DATA”BL52BD18NR8D4NR8D6BR12N
R8U10R8D10BR4NU10R8NU10BR4U10R8D
4L6F6BR8U10L4R8BR4D10U6R8U4D10BR
20BU2U8D4L8U4BU4L2R12L6BU4U8"
500 DATA ONE FOURTH
505 DATA “BR58BD34NU28ND28NL32R3
2"
510 DATA “1/4”
515 DATA”BL46BD18NR8D4NR8D6BR16N
U10BR6U6NR8U4R8BR6R4ND10R4BR6D10
U6R8D6U10BR18BD6R8U4L8U4NR8BU4L2
R12L6BU4U8"
520 DATA ONE FIFTH
525 DATA “BR58BD34NU28M-30,-10M+
30,+10M+30,-10M-30,+10NG22NF22
530 DATA “1/5”
535 DATA”BL46BD18NR8D4R8D6NL8BR6
NU10BR6E10G4H4F10BU10BR4R4ND10R4
BR6D10U6R8D6U10BR18BD6NU4R8U4L8U
4NR8BU4L2R12L6BU4U8"
540 DATA ONE SIXTH
545 DATA “BR58BD34NU28ND28M-26,+
15M+52,-30M-26,15M+26,+15M-52,-3
0”
550 DATA “1/6”
555 DATA”BL56BD18NR8D4R8D6NL8BR4
NR6U6NR6U4R6BR4D6F4E4U6BR4NR6D4N
R6D6R6BR4U10F10U10BR4R4ND10R4BR6
D10U6R8D6U10BR18BD6U8L8ND2BU4L2R
12L6BU4U8"
560 DATA ONE SEVENTH
565 DATA “BR58BD34NU28M-24,-20M+
24,+20M-30,+4M+30,-4M-16,+25M+16
,-25M+16,+25M-16,-25M+30,+4M-30,
-4M+24,-20
570 DATA “1/7”
575 DATA”BL50BD18NR8D4NR8D6R8BR6
NU10BR6NR8U10R8BD4NL2D6BR6U10D4R
8D6U10BR4R4ND10R4BR4D10U6R8U4D10
BR14BU4NU4R8U8D4L8U4NR8BU4L2R12L
6BU4U8"
580 DATA ONE EIGHTH
585 DATA “BR58BD34NU28ND28NL32NR
32NE22NF22NG22NH22"
590 DATA “1/8”
595 DATA”BL46BD18ND10F10U10BR6ND
10BR6ND10F10U10BR4R4ND10R4BR4D10
U6R8U4D10BR18BU4R8U4NU4L8U4NR8BU
4L2R12L6BU4U8"
600 DATA ONE NINTH
605 DATA “BR58BD34NU28M-18,-22M+
18,+22M-30,-6M+30,+6M-26,+15M+26
,-15M-12,+26M+12,-26M+12,+26M-12
,-26M+26,+15M-26,-15M+30,-6M-30,
+6M+18,-22"
610 DATA “1/9”
615 CLS:V=1
620 FORI=1TO9
625 AO(I)=RND(9)
630 IF N(AO(I))=1 THEN 625
635 N(AO(I))=1:NEXTI
640 FOR P=1TO9
645 CLS
650 PRINT@68,”WHAT IS THE SAME A
S”
655 PRINT@132,C$(AO(P))+” ?”
660 FOR Q=1TO2
665 C(Q)=RND(9):IF C(Q)=AO(P) TH
EN665
670 FOR K=Q-1 TO 0STEP-1:IF C(K)
=C(Q) THEN665
675 NEXTK
```

```
680 NEXTQ:C(3)=AO(P)
685 FOR E=1TO3
690 F(E)=RND(3)
695 FOR K=E-1 TO 0 STEP-1:IF F(K
)=F(E) THEN690
700 NEXTK:NEXTE
705 PRINT
710 PRINTTAB(8)"1-"+B$(C(F(1))):
PRINT
715 PRINTTAB(8)"2-"+B$(C(F(2))):
PRINT
720 PRINTTAB(8)"3-"+B$(C(F(3))):
PRINT
725 G$=INKEY$:IFG$="@"THEN785
730 IF G$=""THEN725
735 G=VAL(G$)
740 IF G<1 THEN 725
745 IF G>5 THEN 725
750 IF C(F(G))<>AO(P) THEN765
755 PRINT:PRINT"    RIGHT! IT IS:
"+B$(AO(P))
760 NC=NC+1:GOTO775
765 PRINT:PRINT"    SORRY! IT IS:
 "+B$(AO(P))
770 NW=NW+1775
X$=INKEY$:IFX$<>CHR$(13)THEN
775
780 NEXT P
785 CLS:PRINT@101,"YOU TRIED"NC+
NW"TIMES &":PRINT@165,"ANSWERED"
NC"CORRECTLY"
790 PRINT@229,"WHILE DOING"NW"WR
ONG."
795 NQ=NC+NW:IF NQ=0THEN NQ=1
800 MS=INT(NC/NQ*100)
805 PRINT@293,"YOUR SCORE IS"MS"
%."
810 PRINT@357,"ANOTHER TRY (Y/N/
C) ?";
815 X$=INKEY$:IFX$="Y"THEN RUN
820 IFX$="N"THENCLS:END
825 IFX$="C"THEN835
830 GOTO815
835 IFP>9THENRUNELSEIFV=1THEN645
840 IFY>9THENRUNELSEIFV=0THEN310
```

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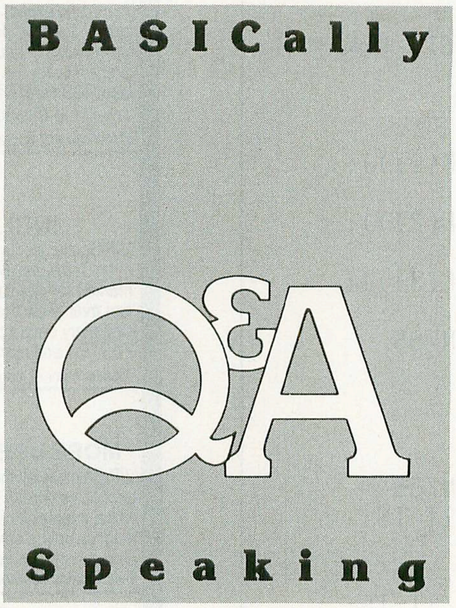
BASICally Speaking



By Larry Boeldt

Dear Larry:

I have a 128K CoCo 3 with Disk Extended BASIC *Version 2.0. After speaking with someone at Microcom Software about ROM Version 1.1 advertised in* THE RAINBOW*, I would like to buy it. I was assured that this chip would give me the use of the DOS command, however, this was all that I could find out. Are there are other commands this chip would give me access to? Is this the latest version ROM for Disk* BASIC*? What else can you tell me about it?*

Bert Hall
New Orleans, Louisiana

Dear Bert:

Disk Basic 1.1 is the same on both CoCo 2 and 3. The major changes in Version 1.0 are the power supply requirements and a working DOS command. On the CoCo 3, the heading appears as Disk BASIC2.1, but this is due to enhancements in BASIC ROM, not the Disk ROM. You must have Version 1.1 to run 0S-9 Level II using the `DOS` command.

Dear Larry:

I was born in Vienna, Austria and came to America in March 1987. I have a CoCo 3, CCR-81, b/w TV, and have written a paint program for the CoCo 3 under ECB, which works with `HSCREEN 2`*. The* `SAVE` *and* `LOAD` *routines (listed below) each take about 10 minutes to complete. Is there an easier (faster) way to save the screens to cassette?*

```
FOR X=0 TO 320
FOR Y=0 TO 191
PRINT #-1,HPOINT(X,Y)
NEXT Y NEXT X
```

(The load routine is much the same only the file is read.)

Hubert Pikal
Tillson, New York

Dear Hubert:

Yes, there is a way. I have modified the `HSAVE` and `HLOAD` commands that appear in THE RAINBOW from time to time. I think you will find these subroutines useful. Remember to make sure that the routines are somewhere in the beginning of your program to prevent the computer from crashing.

Listing 1:

```
1500 REM***LOAD A 32K PICTURE***
1510 REM
1520 HSCREENO:WIDTH 32:LINE INPU
T"ENTER THE FILENAME: ";F$
1525 CLS:PRINT"READY CASSETTE PR
ESS PLAY AND PRESS ANY KEY WHEN
READY":EXEC 44539
1530 HSCREEN 2
1540 FOR I=&H70 TO &H73
1550 POKE &HFFA2,I
1570 CLOADM F$
1580 NEXT I
1590 POKE &HFFA2,&H7A
```

Listing 2:

```
1000 REM*****SAVE 32K PICTURE*****
1010 REM
1020 WIDTH32:HSCREEN 0:LINEINPUT
"ENTER THE FILENAME: ";N$
1025 CLS:PRINT"READY CASSETTEREC
ORDER AND PRESS ANY KEY WHEN REA
DY":EXEC 44539
1030 FOR I=&H70 TO &H73
1040 POKE &HFFA2,I
1060 CSAVEM F$,H4000,&H5FFF,445 39
1070 NEXT I
1080 POKE &HFFA2,&HA7
```

Good Luck!

Larry Boeldt has programmed on the Color Computer for five years. He has experience on BASIC*, Pascal and* FORTRAN IV*. He runs a software customizing business for the CoCo market.*

Dear Larry:

Is there any way that I can use a tab in `POKE 111,254:DIR`*. I don't know enough about programming to figure it out for myself, and would appreciate any help I can get. I am planning on printing a directory list to my printer and putting the names in columns, making it much easier to find a program when I need one.*

Leo J. Arsenault
Silver Spring, Maryland

Dear Leo:

I don't know of any way to do what you have described. However, I have written a short program to solve your problem. I will also take this opportunity to describe the workings of Disk BASIC. First, here is the listing:

Listing 3:

```
100 CLEAR 5000
110 DIM S$(16,2)
120 FOR S=1 TO 16
130 DSKI$ 0,17,S+2,S$(S,1),S$(S,
2)
140 NEXT S
150 FOR S=1 TO 16
160 FOR T=1 TO 2
170 S$=S$(S,T)
180 FOR R=1 TO 128 STEP 32
190 T$=MID$(S$,R,11)+STRING$(8,3
2)
200 IF ASC(T$)=0 THEN 250
210 IF ASC(T$)=255 THEN 300
220 PRINT #-2,T$;
230 C=C+1
240 IF C=4 THEN C=0:PRINT #-2
250 NEXT R
260 NEXT T
270 NEXT S
300 END
```

Let's start with the disk. A disk formatted using `DSKINI` has 35 tracks (0 through 34), which are actually concentric circles. Each of these circles is divided into granules and then into sectors. There are two granules per track, nine sectors per granule, 18 sectors in a track, while there are only 68 granules per disk. When you buy a disk it is blank, like a cassette tape, so in order for the computer to use the disk, it must be formatted.

You might be wondering why there are only 68 granules on a disk. The computer has to know which granule a file is stored on so it reserves one track (Track 17) for this purpose. There is no way that Disk BASIC can store any form of program on this track.

If you look at the program, there is a

`DSKI$` statement in Line 130. The first value specifies the drive number to read from (zero); the second number is the track (notice it is 17); the third is the sector. Notice that it starts at the third sector (s+2). The last are the contents of the specified sector split into blocks of 128 bytes.

Why, you might ask, do we only use sectors 3 through 18 to print out our filenames? The explanation is simple. The first sector of Track 17 is left blank (for future use) and the second sector is used to tell which granule a given program is stored on. This sector is known as the File Allocation Table (FAT for short). Then there are the filenames.

A filename entry takes up 32 bytes per sector, 11 of them for the actual filename, five for finding the file in the FAT, and the remaining 16 reserved for future use by Tandy. If you look closely at Line 200, the `IF` statement checks if the first character of a file entry is an ASCII 0. When a file is killed, Disk BASIC changes the first character of the filename to a `CHR$(0)` character. The next line checks for an ASCII 255 character that marks the end of the filename list.

I hope this gives you an idea of how Disk BASIC as well as the directory print program works. Thank you for your question.

Dear Larry:

I am having difficulties making animation with graphics. I can make a drawn picture walk or move only very slowly, and not without having to clear the screen over and over again. The graphic movement of a circle can't be erased by the `PRESET` *command. Please show me a short, well-developed game or graphics picture. I hope I'm not asking too much.*

Jonathan Tolski
Torrington, Connecticut

Dear Jonathan:

Animation is the subject of quite a few letters. I think it deserves a close look. I will show you a very simple way of producing the proper results. Remember these ideas are not the only way to create animation.

I have written a short program (Listing 4), which demonstrates a standard form of animation. It simply picks up a block of the screen, places the picture in that spot, and puts the original block over the picture. There is a slight delay between the last two steps, which helps to alleviate the occurring flicker.

In a game, this delay time could represent some type of test to see if an enemy has been hit or to read the joystick ports etc. The program is for the CoCo 3, but would easily work on the Coco 2 with a few changes (coordinates and `GET`/`PUT` buffer allocation). It simply draws a spaceship, a planet and randomly plots some stars in the background. The program then goes through the `HGET`/`HPUT` sequence described above. Notice that the `HPUT` command for the spaceship has the word `NOT` at the end instead of `PSET`. Try replacing `NOT` with `PSET` and notice the results. Then try `AND` and `OR` and remember the results. The logic statements that are supported can cause some spectacular results.

You can decide on the form of animation you would like to use. You might not want to pick up the portion of the screen before laying the other down. This second method would increase the speed of your animation. Remember, if you want to save the background, use the first method.

Listing 4:

```
10 HBUFF 1,71
20 HBUFF 2,71
30 HSCREEN 2
40 PALETTE 0,0:PALETTE 1,9
50 HDRAW"BM3,3C5F3R6F2E1L8U4"
60 HGET(0,0)-(15,7),1:HLINE(0,0)
- (15,7),PRESET,BF
70 FORR=1TO200:HSET(RND(320),RND
(191),4):NEXT R
80 HCIRCLE(160,96),30,1:HPAINT(1
60,96),1,1
90 FOR X=0 TO 320 STEP 2
100 HGET(X,100)-(X+15,107),2
110 HPUT(X,100)-(X+15,107),1,OR
120 FOR T=1 TO 20:NEXT T
130 HPUT(X,100)-(X+15,107),2,PSE
T
140 NEXT X
150 GOTO 90
```

Your technical questions are welcomed. Questions about specific BASIC programming problems can be addressed to BASICally Speaking, THE RAINBOW, P. O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Questions can also be sent to Larry through the Delphi CoCo SIG. From the CoCo SIG> prompt, pick Rainbow magazine Services, then, at the RAINBOW> prompt, type `ASK` (for Ask the Experts) to arrive at the EXPERTS> prompt, where you can select the "BASICally Speaking" online form which has complete instructions.

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Dynamic Random Access Memory Explained

By Tony DiStefano
Rainbow Contributing Editor

Just about everyone and his brother in the computer business knows about RAM, Random Access Memory. But how much do you really know about it? Most users know enough about it to get by and how much RAM is needed to do certain things. Some years ago, many programs required only 16K. Then there was the 32K memory craze, with everyone using the piggyback technique. Moving on to 64K was then the limit for the CoCo. When the bank-switching technique arrived, everyone used it, breaking the 64K barrier. The CoCo 3 brought 128K, expandable to 512K. But as a hacker, you must know more than just how much memory your computer has. It is important to know the kinds of RAMs available and how these work. I will quickly review the basic concepts of RAM, then discuss the finer details of DRAM, or Dynamic RAM.

Let's start by reviewing a static RAM. Figure 1 shows a 2K-by-8 static RAM chip in a 24-pin package with Vcc and GND. The Vcc is 5 volts, all that is needed to power this chip. There are eight data lines labeled D0 to D7, then 11 address lines, A0 to A10. To understand why there are 11 address lines, remember binary numbers. Each line has two states, Hi and Lo; for every extra address line added, the amount of memory doubles. For 11 lines it is 2 times 2 times 2, eleven times. That gives a total of 2K or 2048. There is also a sole Read/Write line and two Chip Enable (CE) lines. This accounts for 24 lines.

That is how a static RAM chip works. When the CPU reads or writes to RAM, it puts out an address first. Any data written into a static RAM chip stays there until power is removed from it or it is changed by the CPU or other device. Each memory location is made up of a flip-flop circuit. When flipped, it stays flipped; when flopped, it stays flopped — thus the name *static*. It takes up two transistors and a support circuit for each cell, as well as a lot of room on the chip, adding to its cost. This is one of two major differences between static and dynamic memory.

In general, dynamic memory has a much higher capacity than static memory, over 100 times greater than the 2K static RAM chip. There is not enough room on a small IC chip for all those transistors so the IC designers made a small change in the design to save both room and money. The standard flip-flop memory cell was changed to one transistor and capacitor, the capacitor becoming the new memory cell. When the memory cell was given a Hi, the capacitor was charged; when requiring a Lo, it was discharged. When reading the data, a sense amplifier reads voltage across the capacitor, which, if above a certain voltage, is considered to have a Hi. If not, it has a Lo. This worked well to lower cost and real estate.

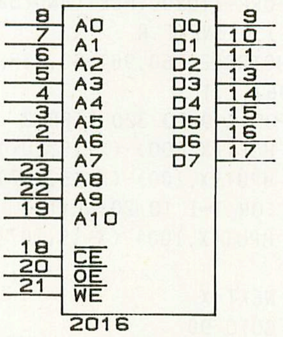

Figure 1:

However, one small problem is that when the capacitor memory cell is not accessed for a while, the capacitor discharges due to leakage. When the sense amp reads the voltage, it is not high enough to convince the amp that it is Hi, so data is lost. The designers added extra circuitry to refresh (recharge) the capacitor occasionally before voltage gets too low. The voltage across the capacitor is dynamically changing, dropping when it leaks and rising when it's recharged — thus the term *dynamic refresh*.

This took care of price and space for higher-capacity memory chips, but there is also another problem. The small chip needs a small package, but with high-memory capacities come many address lines. For instance, a 256K-by-1 memory chip requires 18 lines for addressing alone. Add the data and control lines and you have a big package. In order to cut down on address pins, the chip multiplexes these lines. The dictionary definition of multiplex is: "equipped to transmit two or more sets of signals in one or both directions simultaneously over the same wire or radio band." We are not dealing with radios, but the rest of the definition applies, cutting the address lines almost in half. There now is a need for other control lines to allow the chip to recognize when it'sthe first set of address lines and when it's the second. The savings are great enough to warrant the extra circuitry both inside and outside the package.

Those are the major differences between static and dynamic memory. For more details on how dynamic memory works, study the diagram in Figure 2, which shows the pin-out of the well-known 41256 memory chip. It is the 256K-by-1 memory chip commonly used in the CoCo 512K, IBM PC, AT, PS/2, Atari ST, Comodore Amiga, Apple MAC, SE, MAC II and all the clones. It is also used in video processors, VCR electronic pauses, TV Screen on Screen, video freeze frames, laser printers, electronic typewriters, telephone systems, musical electronic keyboards and so on. No wonder there was a shortage! But this chip has just 16 pins and only one data bit. That is to say, it requires eight of these chips to make 256K-by-8 memory.

When we compare this chip with the 2K-by-8 static RAM chip in Figure 1, there are many similarities. Both share Vcc and GND, address and data lines, as well as the R/W line. But instead of Chip Enables, there are RAS and CAS lines that serve many uses. They are used for refresh, multiplexing address lines, and serve as Chip Enables. Information about these areas is necessary for a good understanding of the dynamic memory chip.

Since the address lines are multiplexed and are the first thing the memory chip

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needs to operate, let's look at these first, while following the block diagram in Figure 3. Fully decoding 256K requires 18 address lines, A0 to A17. The 41256, with only nine address lines (A0 to A8) uses the RAS (Row Address Strobe) line to strobe the addresses A0 to A8 into the DRAM chip. It is the responsibility of the computer's support circuitry to generate all the signals required by the DRAM chip. (Critical timings are not discussed here in order to keep things simple. Remember, though, timing is very important and must be respected by the support circuitry if the DRAM chip is to work. For example, in the CoCo the GIME chip takes care of all timing requirements for the DRAM.)

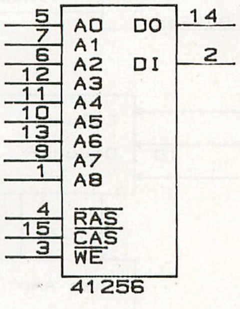

Figure 2:

First the address signals must be stable on the address bus, then the falling edge of RAS locks the lower address into the row address buffer. After the RAS line has done its job, the CPU's A0 to A8 must be taken off the chip and replaced with the CPU's A9 to A17, which is accomplished by the CPU's support circuitry. When A9 to A17 appears on the DRAM's address bus, (A0 to A8) the CAS (Column Address Strobe) does its job. On the falling edge of CAS, the upper address is locked into the column address buffer. These buffers (row and column) feed into the row and column decoders that access the sensing amps and then the memory cells themselves.

When the RAS/CAS sequence occurs, the chip is selected and, depending on the Read/Write line, a read or write cycle is completed. If a read cycle was executed, the DOUT pin will have the data from that cell; if a write cycle was executed, the data present at DIN is transferred into the accessed memory cell. When all is finished, the cycle starts again, first with the RAS, then CAS; then data becomes valid. All this is known as one memory cycle.

A typical DRAM chip can handle several different modes: Read-Modify-Write, RAS Only Refresh, Hidden Refresh, Page Mode, and Nibble Mode. They are all slight variations of the same Read/Write cycle, which you will understand better as we continue.

Reading and writing data is all the CPU does as far as memory goes, but the DRAM has one more requirement — refresh. I explained why the DRAM needs refresh and will now show you how it's done.

Most DRAMs on the market today require RAS Only Refresh. If you look at Figure 3, you can see that the Row Decoder has only eight lines, meaning that only 256 refresh cycles are required in order to keep all data refreshed in the

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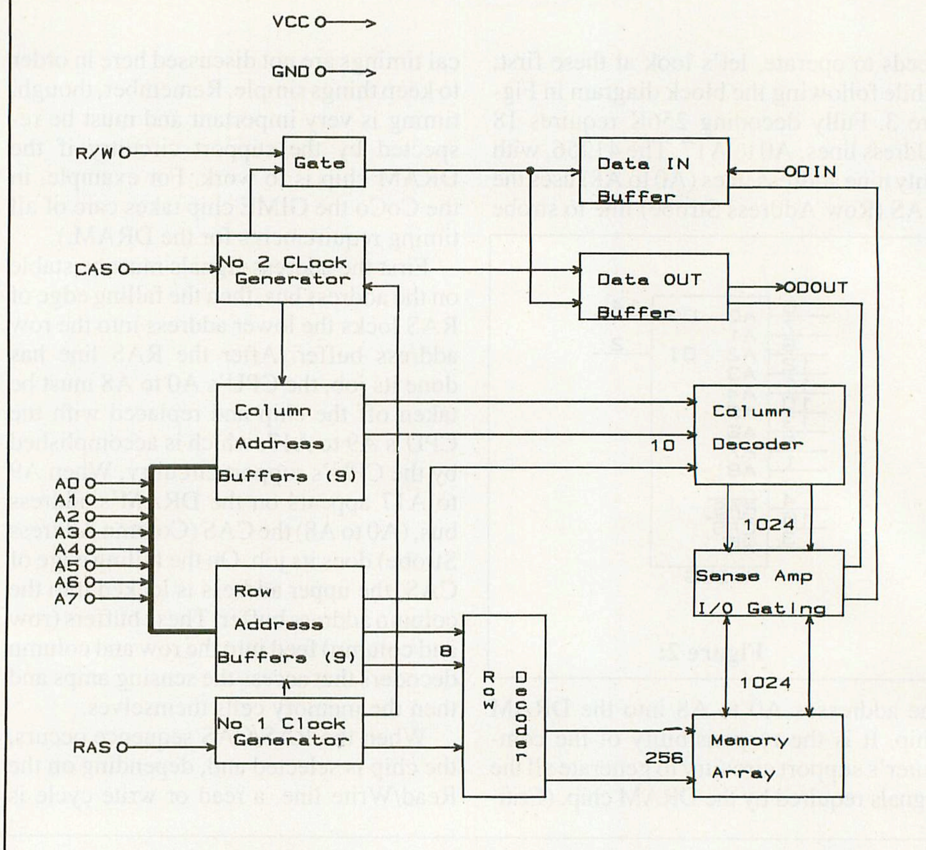

Figure 3:

DRAM chip, keeping the refresh circuitry to a minimum. An eight-bit counter along with its support circuitry is required.

There are many ways of refreshing a DRAM chip, depending on design factors. As long as each of the 256 RAS locations are accessed once every 4ms, the refresh is satisfied.

In software the CPU simply has to make 256 reads or writes every 4ms. This is low-cost but not very practical because it takes up a lot of CPU time. If the CPU has the time, great. The most common way is to let the video circuitry do the work since most video circuits are bit-mapped, or have at least one bit-mapped plain. If video is unavailable, an independent circuit usually does the trick. Again, there are a couple of ways to approach this. One is to put in a refresh cycle when the CPU doesn't need the memory. The only problem is that there needs to be at least 256 free spots every 4ms. Another way is to make the CPU wait every time you refresh.

The Hidden Refresh method involves strobing in a refresh cycle in the middle of the CAS cycle. Since the CAS buffer is latched relatively early in the CAS cycle while the DRAM is fetching data, the cycle can be squeezed in. With CAS always low, the CAS address is taken off the address bus, and the Refresh data counter is presented to the DRAM's bus. The RAS strobe is then fired and the refresh cycle is completed.

Page Mode is for faster I/O more than anything else. The mode may be used when many column accesses are needed within the same RAS area. This is done by latching the RAS as usual but then doing many CASes without deselecting the RAS signal. This mode is used when speed is needed without an increase of power.

The Nibble Mode operation allows faster successive data operation on four bits. The first of four bits are accessed as usual. Then by keeping RAS low, CAS can be accessed four times to get the four bits each in the next three pages at a rate faster than accessing them separately.

Not all these modes are available on all DRAMs. You must refer to the data sheets of each particular chip in order to see if the feature you need is available. This article by no means includes all the data on DRAMs. I have left out timings, chip loads and many other small details. If you want to design a circuit involving DRAM, make sure you know a lot about the chip itself and the system you are designing it for before starting. More specific details can be found in the DRAM data manuals.

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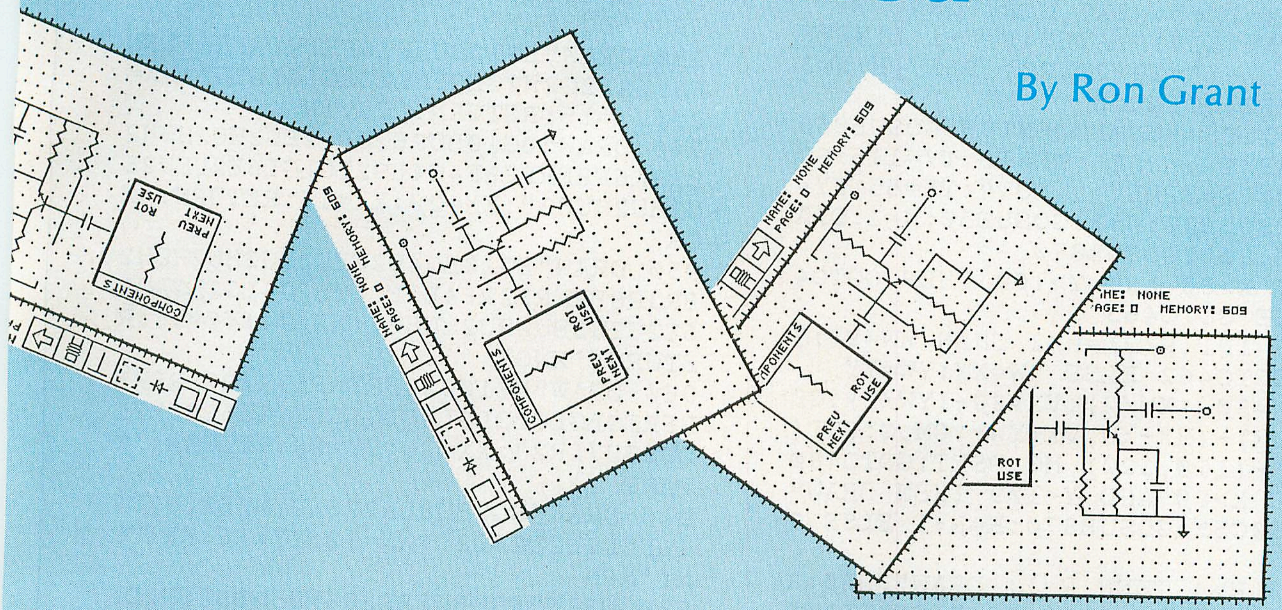
A "mini-CAD (Computer-Aided Design)" program becomes more user-friendly

The Schematic Scoundrel, Revisited

By Ron Grant



After keying in Peter Kerckhoff's program from "CoCocad: the Schematic Scoundrel" (October '85, Page 130), I found that one thing was needed to make this already great program more user-friendly — symbol rotation.

In the original program, in order to rotate a symbol, it was necessary to build separate symbols by "clicking" the mouse until the right one appeared. With this modification it is no longer necessary to wade through repetitive symbols. Any symbol can be rotated.

You won't notice the difference until you click on the familiar diode icon. To rotate a symbol, move the cursor to ROT in the menu and click the mouse button. The displayed symbol will rotate 90 degrees clockwise each time the button is pressed. Once the symbol is facing the proper direction, simply USE the symbol as before. Because the program is large and packed tightly, this modification presents a space problem. The end result comes close, using 158 bytes more. Most of the space for the modification comes from the symbols that are modified or deleted. To make

Lines	Description
100	Allows for text to be drawn normally after a symbol rotation.
170	Allows the arrow cursor to be properly redrawn after symbol rotation.
440	Adds the new function ROT.
460 to 465	Allow for the selection of component functions and changes the number of available components.
470	Changes the number of available components.
510	Ensures the component is placed properly on the screen.
870 to 874	Perform the rotatate function.
875	Changes the number of available components.
1805, 1810 and 1825	Ensure the symbol is saved in its rotated form.

All other lines are changes to components to function with the rotate capability.

Table 1

Ron Grant has been working with computers since 1985, and is a Chief Petty Officer in the United States Navy. He, his wife, Teresa, and their daughter, Patricia, currently reside in Groton, Connecticut.

the modification, type in the listing. The line numbers are arranged to replace the corresponding *CoCocad* lines, so be sure your copy of *CoCocad* is numbered identically to the listing in the RAINBOW October '85 issue. Otherwise, you will have to match up the correct lines for replacement. In addition, you need to delete lines 1000, 1020, 1040, 1090 and 1110.

(Questions or comments about this modification may be directed to the author at 130 Michigan Dr., Groton, CT 06340. Please include an SASE if requesting a reply.) □

Editors Note: For your convenience, the entire modified CoCocad program is included on this month's RAINBOW ON TAPE and DISK in place of the modifications.

The Listing: CADMOD

```
100 FOR C=1 TO LEN(T$):DRAW"A0;B
M=TX;,=TY;":A$=MID$(T$,C,1):GOSU
B 80:TX=TX+5:NEXT C:RETURN
170 DRAW"A0":PLAYB$:F=F-1:LINE(F
*19+1,1)-(F*19+20,20),PSET,B:N=3
:GOSUB50:GOTO150
440 R=1:T$="COMPONENTS":GOSUB850
:T$="NEXT   USE":TX=55:TY=115:GO
SUB100:T$="PREV   ROT":TX=55:TY=
107:GOSUB100:N=3:GOSUB50:N=1:DRA
W"BM80,80":GOSUB870
460 IF X>80 AND Y>109 THEN GOTO4
61 ELSE GOTO463
461 IF INT(R/2)=R/2 THEN XW=YY:Y
W=XX:GOTO462 ELSE XW=XX:YW=YY
462 HX=80-(XW/2):VX=80-(YW/2):GE
T(HX,VX)-(HX+XW,VX+YW),CM,G:PUT(
50,50)-(110,120),MO,PSET:GOTO480
463 IF X>80 AND Y<109 THEN DRAW"
BM80,80C5":GOSUB870:R=R+1 ELSE G
OTO465
464 IF R>4 THEN R=1: DRAW"BM80,8
0C0":GOSUB870:GOTO450 ELSE DRAW"
BM80,80C0":GOSUB870:GOTO450
465 IF X<80 THEN DRAW"BM80,80C5"
:GOSUB870:R=1:DRAW"A0;BM80,80C0"
:IF Y<109 THEN 470 ELSE N=N+1:IF
 N<20 THEN GOSUB870:GOTO450 ELSE
 N=1:GOSUB870:GOTO450
470 N=N-1:IF N>0 THEN GOSUB870:G
OTO450 ELSE N=19:GOSUB870:GOTO45
0
510 PLAYB$:POKEAD(PG),N:POKEAD(P
G)+1,(LX+(XW/2)):POKEAD(PG)+2,(L
Y+(YW/2)):POKEAD(PG)+3,R:AD(PG)=
AD(PG)+4:POKEAD(PG),0:GOSUB110:G
OTO480
870 ON R GOTO 871,872,873,874
871 DRAW"A0":GOTO875
872 DRAW"A1":GOTO875
873 DRAW"A2":GOTO875
874 DRAW"A3":GOTO875
875 ON N GOTO 880,890,900,910,92
0,930,940,950,960,970,980,990,10
10,1030,1050,1060,1070,1080,1100
880 DRAW"BG10BU2U16R13FRF4DFD2GD
G4LGL13":XX=20:YY=16:RETURN:'AND
890 DRAW"BG12BU4U16R12FRF4DFDE2R
F2G2LH2DGDG4LGL12":XX=24:YY=16:R
ETURN:'NAND
900 DRAW"BG10BU2E2UEU2EU2HU2HUH2
R9FRFRF2RF4G4LG2LGLGL9":XX=20:YY
=16:RETURN:'OR
910 DRAW"BG12BU4E2UEU2EU2HU2HUH2
R9FRFRF2RF4E2F2G2H2G4LG2LGLGL9":
XX=24:YY=16:RETURN:'NOR
920 DRAW"BG8U16FRFRFRFRFR2FRFRFG
LGLGL2GLGLGLGLG":XX=16:YY=16:RET
URN:'BUFFER
930 DRAW"BG10BU2U16FRFRFRFRFR2FR
FRFE2F2G2H2GLGLGL2GLGLGLGLG":XX=
20:YY=16:RETURN:'INVTR
940 DRAW"BG10BU2E2UEU2EU2HU2HUH2
BR3R6FRFRF2RF4G4LG2LGLGL6E2UEU2E
U2HU2HUH2":XX=20:YY=16:RETURN:'X
OR
950 DRAW"BG12BU4E2UEU2EU2HU2HUH2
BR3R6FRFRF2RF4E2F2G2H2G4LG2LGLGL
6E2UEU2EU2HU2HUH2":XX=24:YY=16:R
ETURN:'XNOR
960 DRAW"BG10U20FRFRFRFRFR2FRFRF
RFRFGLGLGLGLGL2GLGLGLGLGU6BR3R2L
DU2BU7LR2":XX=20:YY=20:RETURN:'O
PAMP
970 DRAW"BG8BU8BR2R6NU5ND5E6U2D2
G6F5L2E2D2FD2":XX=12:YY=16:RETUR
N:'NPN
980 DRAW"BG8BU8BR2R6NU5ND5E6U2D2
G2U2F2L2G4F6D2":XX=12:YY=16:RETU
RN:'PNP
990 DRAW"BG16BU16R4E2F4E4F4E4F4E
2R4":XX=32:YY=8:RETURN:'REST
1010 DRAW"BG6BU6R4NU4ND4BR4NU4ND
4R4":XX=12:YY=8:RETURN:'CAP
1030 DRAW"BG4BU4U2R2F2NR4G2L2U2"
:XX=8:YY=8:RETURN:'I/O
1050 DRAW"BG2BU2UER2FD2GL2HU":XX
=8:YY=8:RETURN:'NOT DOT
1060 DRAW"BG2BU2NR4BUNR4BER2BFBD
2NL4BGL2":XX=8:YY=8:RETURN:'CON
DOT
1070 DRAW"BG4BU8BR4D5L3F3E3L3":X
X=8:YY=8:RETURN:'GND
1080 DRAW"BG8BU8R6ND4U4F4NG4NU4N
D4R6":XX=16:YY=8:RETURN:'DIODE
1100 DRAW"BG16BU14R4E2F4E4UNH2NE
2U5D6F4E4F4E2R4":XX=32:YY=12:RET
URN:'POT
1805 IF D>50 THEN 1825
1810 X=PEEK(AD(PG)+1):Y=PEEK(AD(
PG)+2):R=PEEK(AD(PG)+3):AD(PG)=A
D(PG)+4
1825 X=PEEK(AD(PG)+1):Y=PEEK(AD(
PG)+2):AD(PG)=AD(PG)+3
```

NOVICES NICHE

THE RAINBOW is a teaching environment and we realize that the majority of our readers will always be beginners. In our continuing effort to always keep the new user in mind, and in addition to the many beginner feature articles and programs published in every issue, "Novices Niche" contains shorter BASIC program listings that entertain as well as help the new user gain expertise in all aspects of the Color Computer: graphics, music, games, utilities, education, programming, etc.

Games

Bowling
by Thomas Wong

CoCo 3

Is your best buddy bugging you to go bowling? Load *Bowling* into your CoCo 3 and take on four friends or family members for a bowling match.

After choosing the number of players, a scoreboard and an alley are displayed with a ball scrolling on the left side. To roll the ball, press a key. A "pin" beside the player number on the scoreboard shows which player is up. Final scores are posted on the bottom after each round. If you roll the ball down the center, you receive an X to show a strike.

Bowling uses the CoCo 3's advanced graphics capabilities. You can modify the program to suit your needs; experimenting is the key to learning about the CoCo's features. A perfect score is 1000 points. Good luck!

The Listing: `BOWLING`

```
0 ‘ COPYRIGHT 1989  FALSOFT,INC
5 POKE65497,0:DIMA(9),B(9),C(9),
D(10),E(10),F(4),G(4):HBUFF1,50:
HBUFF2,50:HSCREEN2:HDRAW”C4BM40,
12U3E1F1D3R1F2G2L4H2E2R1":HCIRCL
E(20,12),4,4:HPAINT(20,12),4,4:H
PAINT(40,14),2,4:HGET(16,8)-(24,
16),1:HGET(37,8)-(45,16),2
10 FORH=1TO9:READA(H),B(H),C(H):
NEXT:FORI=1TO10:READD(I),E(I):NE
XT:FORJ=1TO4:READF(J),G(J):V(J)=
7:W(J)=J+1:N(J)=0:NEXT
15 WIDTH32:PRINT@12,”BOWLING”:IN
PUT”        # OF PLAYERS? (1-4)”;K
:IFK<1ORK>4THEN15
20 HSCREEN2:HCOLOR4,0:HLINE(15,6
5)-(305,151),PSET,B:HLINE(20,70)
-(300,146),PSET,B:O=1:FORP=7TO34
STEP3:HPRINT(P,1),O:O=O+1:NEXT:O
=1:FORQ=2TO1+K:HPRINT(5,Q),O:O=O
+1:NEXT:LL=0:GOTO60
25 FORX=1TO10:T=24:U=16:FORY=1TO
K:Z=0:AA=1:HPUT(T,U)-(T+8,U+8),2
30 IFZ=2THEN55ELSEZ=Z+1
35 FORFF=1TO10:HPUT(D(FF),E(FF))
-(D(FF)+8,E(FF)+8),2:NEXTFF
40 GOSUB75:IFCC$=””THEN40ELSESOU
ND20,1
45 FORKK=24TO291STEP8:HPUT(KK,A(
BB))-(KK+8,A(BB)+8),1:HLINE(KK,A
(BB))-(KK+8,A(BB)+8),PRESET,BF:N
EXTKK:IFZ=1ANDB(BB)<>9THENHPRINT
(V(Y),W(Y)),B(BB):V(Y)=V(Y)+1:N(
Y)=N(Y)+10*B(BB):GOTO30ELSEIFZ=2
THENHPRINT(V(Y),W(Y)),C(BB):V(Y)
=V(Y)+2:N(Y)=N(Y)+C(BB)
50 IFZ=2THENGOTO55ELSEHPRINT(V(Y
)+1,W(Y)),”X”:PLAY”V31O4T100ABCD
EFG”:V(Y)=V(Y)+3:N(Y)=N(Y)+100
55 HLINE(T,U)-(T+9,U+8),PRESET,B
F:U=U+8:NEXTY
60 FORGG=1TOK:HLINE(8*F(GG),8*G(
GG))-(8*(F(GG)+32),8*G(GG)+8),PR
ESET,BF:HPRINT(F(GG)-3,G(GG)),GG
:HPRINT(F(GG),G(GG)),N(GG):NEXTG
G:IFLL=0THENLL=1:GOTO25
65 NEXTX
```

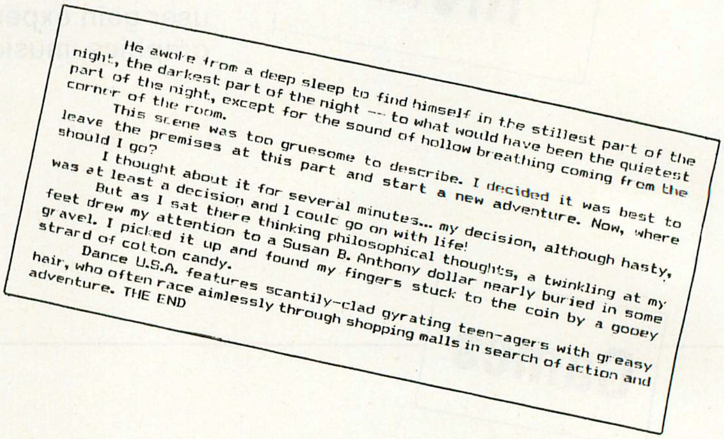
```
70 HPRINT(11,17),"PLAY AGAIN ? (
Y/N)":PP$=INKEY$:IFPP$="Y"THENRE
STORE:GOTO10ELSEIFPP$="N"THENPOK
E65496,0:CLS:ENDELSE70
75 IFAA=1THENHH=1:II=9:JJ=1:AA=2
:GOSUB80:RETURNELSEHH=9:II=1:JJ=
-1:AA=1:GOSUB80:RETURN
80 FOR BB=HH TOII STEP JJ:CC$=IN
KEY$:IFCC$<>""THENRETURN
85 HPUT(24,A(BB))-(32,A(BB)+8),1
:HLINE(24,A(BB))-(32,A(BB)+8),PR
ESET,BF:NEXTBB:RETURN
90 DATA72,0,0,80,1,2,88,3,4,96,5
,6,104,9,8,112,6,7,120,4,5,128,2
,1,136,0,0,288,80,272,88,256,96,
288,96,240,104,272,104,256,112,2
88,112,272,120,288,128,6,20,6,22
,27,20,27,22
```

Story Writer

by John Friedrich

16K
ECB

Have you ever played the party game where each person writes part of a paragraph, folds the paper over most of the words, and lets the next person try to finish the story? Even if you haven't, this computer adaptation will be loads of fun at your next get-together. Two to one-hundred people can play, and the finished story can be sent to the printer. The instructions are simple: Each player takes a turn at the computer while the others are out of the room. When one person is finished typing, he or she presses ENTER, and the next person continues. To print a finished story press ENTER before typing, or wait for the one-hundred paragraph limit to come up. The story can be listed to the screen or printer.



```
     He awoke from a deep sleep to find himself in the stillest part of the
night, the darkest part of the night -- to what would have been the quietest
part of the night, except for the sound of hollow breathing coming from the
corner of the room.
     This scene was too gruesome to describe. I decided it was best to
leave the premises at this part and start a new adventure. Now, where
should I go?
     I thought about it for several minutes... my decision, although hasty,
was at least a decision and I coulc go on with life!
     But as I sat there thinking philosophical thoughts, a twinkling at my
feet drew my attention to a Susan B. Anthony dollar nearly buried in some
gravel. I picked it up and found my fingers stuck to the coin by a gooey
strard of colton candy.
     Dance U.S.A. features scantily-clad gyrating teen-agers with greasy
hair, who often race aimlessly through shopping malls in search of action and
adventure. THE END
```

The Listing: STORYWRT

```
0 ' COPYRIGHT 1989  FALSOFT,INC
5 '** CLEAR MAXIMUM STRING SPACE
10 CLEAR 1000
20 PMODE 0,1:PCLEAR 1
30 CLEAR MEM
35 '** 16K OR 64K? N=TOTAL LINES
40 IF PEEK(116)=127 THEN N=100 E
LSE N=40
43 '** REDUCE N IF DISK IS USED
46 IF PEEK(188)=14 THEN N=N-8
50 DIM A$(N+1)
55 '** SET UP TITLE SCREEN
60 CLS
70 PRINT"     STORYTIME PROGRAM
":PRINT:PRINT"CREATED BY: JOHN F
RIEDRICH":PRINT:PRINT
80 INPUT"PRESS ENTER TO BEGIN";A
$
85 '** INCREASE LINE COUNT
90 X=X+1
95 '** DISPLAY END OF LAST LINE
       AND INPUT NEW LINE
100 CLS
110 PRINT RIGHT$(A$(X-1),32)
120 PRINT@384,"TYPE IN A PARAGRA
PH..."
130 IF X=N THEN PRINT@448,"LAST
LINE!  FINISH UP!"
140 PRINT@32:LINE INPUT A$(X)
145 '** IF NO LINE TYPED OR ALL
        LINES USED, PRINT THEM
150 IF A$(X)="" THEN N=X-1
160 IF X>N-1 THEN 200
165 '** WAIT FOR NEXT PERSON
170 CLS0:PRINT@200,"NEXT PERSON,
 PLEASE";
180 EXEC 44539
190 GOTO 90
195 '** LAST LINE = 'THE END'
200 A$(N+1)="THE END"
205 '** SCREEN OR PRINTER?
210 CLS
220 PRINT"READY TO PRINT STORY"
230 PRINT:INPUT"SCREEN: 0, OR PR
INTER: -2";A
240 IF A<>0 AND A<>-2 THEN 230
245 '** PRINT ALL LINES
250 CLS
260 FOR X=1 TO N+1
270 PRINT#A,A$(X)
275 '** PAUSE FOR READING
280 IF A=0 THEN EXEC 44539
290 NEXT X
295 '** CHECK FOR REPRINTING
300 CLS
310 INPUT"PRINT STORY AGAIN (Y/N
)";A$
320 IF A$="Y" THEN 210
325 '** RETURN MEMORY TO NORMAL
330 CLEAR 1000:PCLEAR 4:END
```

Tax and Tip
by Ellen Aftamonow

16K
ECB

Have you ever gone out to lunch with several people and received only one bill? Here's a handy program that prints out a table you can easily carry with you. You will be able to tell at a quick glance exactly what everyone owes, including tax and tip.

Be sure to turn on your printer first. The program will ask your state tax. The tip is calculated at 15 percent. The table is from $4 to $10, however, these values can be changed in Line 70. Bon apetite.

The Listing: `TAXTIP`

```
0 ‘ COPYRIGHT 1989  FALSOFT,INC
1 ‘ELLEN AFTAMONOW
2 ’46 HOWE ST.
3 ‘MILFORD, CT 06460
10 CLS8:PRINT@74,”TAX AND TIP”;:
PRINT@206,”BY”;:PRINT@296,”ELLEN
 AFTAMONOW”;:FORZ=1TO1000:NEXT
20 CLS:PRINT@66,”THIS PROGRAM WI
LL PRINT OUT      THE TOTAL AMOUN
T YOU OWE FOR    A MEAL,INCLUDIN
G TAX AND TIP.”
30 PRINT@196,”TURN YOUR PRINTER
ON”
40 PRINT@289,”WHAT IS YOUR STATE
 TAX TO TWO     DECIMAL PLACES?”
:PRINT” (EXAMPLE: 4 1/2 IS 4.50)
“:INPUTTX:TX=TX*.01
50 PRINT@458,”PRINTING”
60 PRINT#-2,TAB(10)”MEAL”;:PRINT
#-2,TAB(20)”TAX”;:PRINT#-2,TAB(3
0)”TIP”;:PRINT#-2,TAB(40)”TOTAL”
70 FORX=4TO10STEP.25:PRINT#-2,TA
B(10):PRINT#-2,USING”$##.##”;X;:
PRINT#-2,TAB(20):PRINT#-2,USING”
$#.##”;X*TX;:PRINT#-2,TAB(30):PR
INT#-2,USING”$#.##”;.15*X;:PRINT
#-2,TAB(40):PRINT#-2,USING”$##.#
#”;X+X*TX+.15*X:Y=Y+1
80 IFY/4=INT(Y/4) THENPRINT#-2,”
 “:NEXTELSENEXT
90 CLS:PRINT@65,”ANOTHER CALCULA
TION (Y/N)”;:INPUTA$
100 IFA$=”Y” THEN20ELSECLS:END
```

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MLBASIC allows for the first time user to quickly compile a program using default compiler settings. The advanced user has the capability of controlling over a dozen settings which control where the program is compiled, which medium to compile to (memory or disk), string space, compiler listings and more.

With all this going for MLBASIC, your might expect the cost to be a little out of your budget. After looking at prices of other BASIC compilers for the COCO 3 you might be correct. But look again at this ad; for only $59.95, you can have a programming language that will spark your interest once again in the COCO.

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Utility

Up-Down LIST
by Grahame Pollock

16K
ECB

I've often wondered why the listing of a program only scrolls one way. On many occasions, I've had to press BREAK and type `LIST500` (or something) to find the line again.

Once you run *Updnlist*, you won't have any more `LIST`ing problems. You can list forward or backward using the up and down arrow keys. Holding down the arrow keys will let you move quickly in either direction through your program listing. If you take your finger off the keys, the listing will freeze.

The Listing: `UPDNLIST`

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 '***UP DOWN LIST***
20 '***FOR THE COCO***
40 '***BY GRAHAME POLLOCK***
50 '***24 KENT ST, MINTO***
60 CLS:PRINT"UP DOWN LIST BY G.P
OLLOCK       USE UP AND DOWN ARR
OW KEYS      TO CONTROL LIST SCR
OLLING"
70 P=256*PEEK(&H25)+PEEK(&H26):P
=P-&H99:CLEAR200,P
80 P=256*PEEK(&H25)+PEEK(&H26):P
=P-&H99:FORX= 0 TO &H99:READ A$:
A=VAL("&H"+A$):POKE P+X,A:NEXT
90 POKEP+2,PEEK(&H182):POKEP+3,P
EEK(&H183):POKEP+4,PEEK(&H184):P
OKE&H1A6,&H7E:POKE&H1A7,VAL("&H"
+LEFT$(HEX$(P+5),LEN(HEX$(P+5))-
2)):POKE&H1A8,VAL("&H"+RIGHT$(HE
X$(P+5),2))
100 POKE&H182,&H7E:POKE&H183,VAL
("&H"+LEFT$(HEX$(P),LEN(HEX$(P))
-2)):POKE&H184,VAL("&H"+RIGHT$(H
EX$(P),2))
210 DATA F,FD,12,12,12,34,12,86,
1,91,FD,27,4,97,FD,20,F,9E,88,8C
,4,10,2F,8,8C,5,E0,2E,8,35,12,39
,35,12,9F,FE,39,86,FF,B7,1
220 DATA 55,B7,1,56,B6,1,55,81,F
7,27,15,B6,1,56,81,F7,27,1F,BD,A
1,C1,81,3,26,EB,86,0,97,FD,7E,A0
,F3,9E,FE,86,5,34,2,35,2,4A
230 DATA 81,0,27,10,34,2,20,4,35
,12,20,2A,30,1E,9C,19,2E,E,9E,19
,9C,19,2E,4,9E,19,30,1F,30,1,20,
16,30,1F,A6,84,81,0,27,2,20
240 DATA F6,30,1F,30,1F,A6,84,81
,0,27,C9,20,F6,9F,66,BD,A9,28,9C
,19,2E,6,F,FD,86,80,9F,89,7E,B7,
84
```

Graphics

On The Run
by Patrick Benny

16K
ECB

Learn how to create smooth animation sequences via *Lion*. This program draws a lion running across a field during a full moon.

The Listing: `LION`

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 'COPYRIGHT (C) 1989
            BY PATRICK BENNY
20 'MY ADDRESS: PATRICK BENNY
            69 2nd CHALOUPE
            R.R.2
            JOLIETTE, P.Q.
            CANADA, J6E 7Y8
30 CLS:PRINT@230,"ONE MOMENT PLE
ASE..."
40 PMODE4,1
50 PCLS
60 DRAW"C3BM8,12R1H1L1U1R1U1R1D1
R1D1F1BU3BL1R4D3R1BU2U3F2D3R2H1B
U2E1U4R1F2D1H1D2H1U1BU1BL6L4G1L3
D1G1BR4R5U1L5E1R4C2BM3,10U1R1BM1
9,3L2G2D1F2R1U4G1D2H1U2"
70 DIM L1(25,13):GET(0,0)-(24,12
),L1,G
80 PCLS
90 DRAW"C3BM7,6R4E1R2D2R1D1R1D4R
1BL2BU2L1D2L3H3U2R4U1R1D1F2L1H1L
4D1R4D2L2U1L1BR9BU5D3E1U2E1F2D1G
1U2L1D1C2BU3BL1L1U1L1D6H1U2G1U1L
1E1L1E2D1BL11BD2L1D1L1"
100 DIM L2(25,13):GET(0,0)-(24,1
2),L2,G
110 PCLS
```

```
120 DRAW"C3BM6,5R6E1D1F1L6D1R6D1
L6G2R1D2R2H1U2R1BR6BU1R1D2G1R2U1
R2D1R1U2L3U1R1U1E1U2E1F2D1G1U2L1
D2C2BU5BL1D1H1D4G1U3L2D1R1D2L1U1
H1U2R2H1R2BL12BD3L1D1"
130 DIM L3(25,13):GET(0,0)-(24,1
2),L3,G
140 PCLS
150 DRAW"C3BM6,4D1R8D1L7D1R8D1L9
G1R4G1L4D1R1BR11BU3D1R3D1F1U1F1U
1R1U1L2H1L2E1R1U2E1D2F1U2F1D1E1U
1L1U1H1C2BL1U1L1D2L1D2G1U4G1D3H1
U2E2R1BL13BD2G1L1D1"
160 DIM L4(90):GET(0,0)-(24,12),
L4,G
170 PCLS
180 DRAW"C3BM6,4R2G1R7D1L6D1R6D1
L6G1D1F1R1H1U1R1BR4R6D1L2F1D1R2H
1E1R1D1R1BH3L1E1U1R1U2R1F2L2D1R1
C2BL2BU4L3G2D2F1U3R1D3E1U3R1D1BL
14L1D1"
190 DIM L5(25,13):GET(0,0)-(24,1
2),L5,G
200 PCLS
210 DRAW"C3BM6,5R8F1L6D1R6F2L2U1
L6F1G1D1F1R1H1U1E1BR7F1L2D2R1E1F
1R1H1U1H1U1R1U3F1D1F1E1L1E1L1U1H
1C2BH1L2G1R3G1L4F1R3D1L3F1R1BL11
BU2L1D1L1"
220 DIM L6(25,13):GET(0,0)-(24,1
2),L6,G
230 DIM BL(25,13):PCLS
240 GET(0,0)-(24,12),BL
250 FOR T=1 TO 50:PSET(RND(255),
RND(70),1):NEXT T
260 CIRCLE(92,40),10,3:PAINT(92,
40),3,3
270 FOR A=0TO255:PSET(A,90,3):NE
XTA
280 PAINT(0,91),3,3
290 PMODE4,1:SCREEN1,1
300 F=0:FOR X=1 TO 231
310 F=F+1
320 IF F=7 THEN F=1
330 ON F GOSUB 370,380,390,400,4
10,420
340 NEXT X:PUT(231,77)-(255,89),
BL,PSET
350 IF INKEY$<>"" THEN END
360 GOTO 300
370 PUT(X,77)-(X+24,89),L1,PSET:
RETURN
380 PUT(X,77)-(X+24,89),L2,PSET:
RETURN
390 PUT(X,77)-(X+24,89),L3,PSET:
RETURN
400 PUT(X,77)-(X+24,89),L4,PSET:
RETURN
410 PUT(X,77)-(X+24,89),L5,PSET:
RETURN
420 PUT(X,77)-(X+24,89),L6,PSET:
RETURN
```

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Doggone
by Lyn Arko

16K ECB

Long `DATA` statements with lots of numbers can be intimidating, but they're easier to type if you understand the context. The `DATA` statements in *Doggone* are actually 36 groups of five variables, each group consisting of a screen location, a word, another screen location, a graphics character and a `PLAY` command. For example, Line 4 tells the computer to read the first item in Line 1 as a number, the second item as a string, the third and fourth as a number, and the fifth as a string. Line 4 continues to say, `PRINT @ 0(A), "where"(A$), PRINT @ 265(B), CHR$(252)(C), PLAY T5L2G(B$),` and continues to the next five variables.

Lower-case letters were selected to present green letters on a black screen, Line 4's `CLS(0)`. The graphics character `252` is `CHR$(140+112)` with `140` being the character and `112` being the color orange.

Line 5 sets four positions for the tail and Line 6 wags the tail, repeating Line 6 until there's a break in the program. Line 7 is just a pause between wags.

Now that I've piqued your curiosity, type in the listing and run the program.

The Listing: `DOGGONE`

```
0 ‘ COPYRIGHT 1989  FALSOFT,INC
1 DATA 0,where,265,252,T5L2G,6,o
h,299,252,L4E,9,where,396,255,C,
32,has,397,243,O-B,36,my,401,255
,O+C,39,lit,402,243,D,42,tle,340
,252,D,46,dog,308,255,O-B,50,gon
e,301,243,L2G,64,oh,333,255,O+L4
G,67,where,365,252,L2A,73,oh,366
,252,L4G
2 DATA 76,where,367,252,F,82,can
,368,252,E,86,he,369,255,D,89,be
,370,252,L1G,96,with,338,255,L8E
,101,his,306,243,F,105,ears,305,
243,L2G,110,cut,304,243,L4E,114,
short,303,243,C,128,and,302,243,
O-B,132,his,335,255,O+C,136,tail
,336,255,L2D
3 DATA 141,cut,266,243,L4O-B,145
,long,309,255,L2G,160,oh,277,243
,O+L4G,163,where,276,255,L2A,169
,oh,300,243,L4G,172,where,332,25
5,F,178,can,364,255,E,182,he,339
,255,D,185,be?,307,255,L4C,491,t
here,334,255,E,497,he,337,255,G,
500,is!,310,255,O+L2C
4 CLS(0):FORX=1TO36:READA,A$,B,C
,B$:PRINT@A,A$;:PRINT@B,CHR$(C);
:PLAYB$:NEXTX
5 Z$(1)=STRING$(2,128)+CHR$(255)
:Z$(2)=CHR$(252)+CHR$(243)+CHR$(
128):Z$(3)=STRING$(3,128):Z$(4)=
Z$(2):Y$(1)=STRING$(2,128):Y$(2)
=Y$(1):Y$(3)=STRING$(2,252):Y$(4
)=Y$(1)
6 FORX=1TO4:PRINT@265,Z$(X);:PRI
NT@297,Y$(X);:GOSUB7:NEXTX:GOTO6
7 FORT=1TO25:NEXTT:RETURN
```

Slope and Funnel
by Tio Babich

CoCo 3

Here's a short, interesting program written for the CoCo 3. It utilizes the 640-by-192 Hi-Res graphics screen to show a fluctuating picture of a Boolean slope and funnel.

The Listing: `SLOPEFNL`

```
0 ‘ COPYRIGHT 1989  FALSOFT,INC
1 PALETTE 0,0:PALETTE 1,63
2 HSCREEN3:HCLS1:HCOLOR0:HPRINT(
8,1)," Fluctuating Slope and Fun
nel"
3 FOR X=0 TO 192 STEP 3
4 HLINE(0,X)-(X+200,192),PSET
5 HCIRCLE(X+300,100),X/2,0,X*.01
6 NEXT X
9 FOR I=1 TO 40:FOR G=0TO8:PALET
TE 0,G:NEXTG:PALETTE 0,0
10 NEXT I:GOTO9
```

Submissions to "Novices Niche" are welcome from everyone. We like to run a variety of short programs that can be typed in at one screen sitting and are useful, educational and fun. Keep in mind, although the short programs are limited in scope, many novice programmers find in enjoyable and quite educational to improve the software written by others.

Program submissions must be on tape or disk. We're sorry, but we cannot key in program listings. All programs should be supported by some editorial commentary, explaining how the program works. If your submission is accepted for publication, the payment rate will be established and agreed upon prior to publication.

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GAME POINT SOFTWARE

This Month's Feature

NEW For CoCo 3

Z'89

by Steve Bjork

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DONUT DILEMMA

NEW For CoCo 1, 2

by Nickolas Marentes

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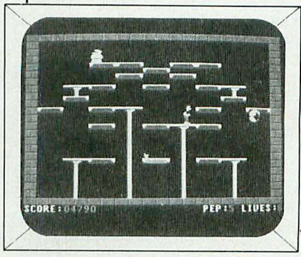
Rupert Rythym

by Nickolas Marentes



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NEW For CoCo 1, 2, 3

by Steve Bjork

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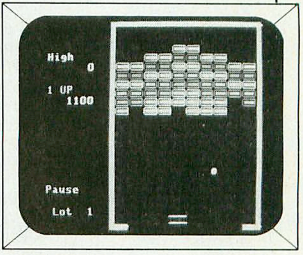

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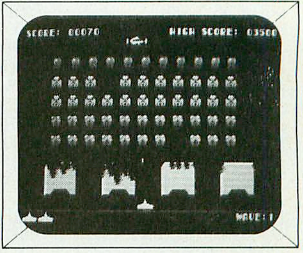

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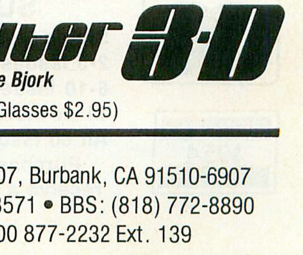

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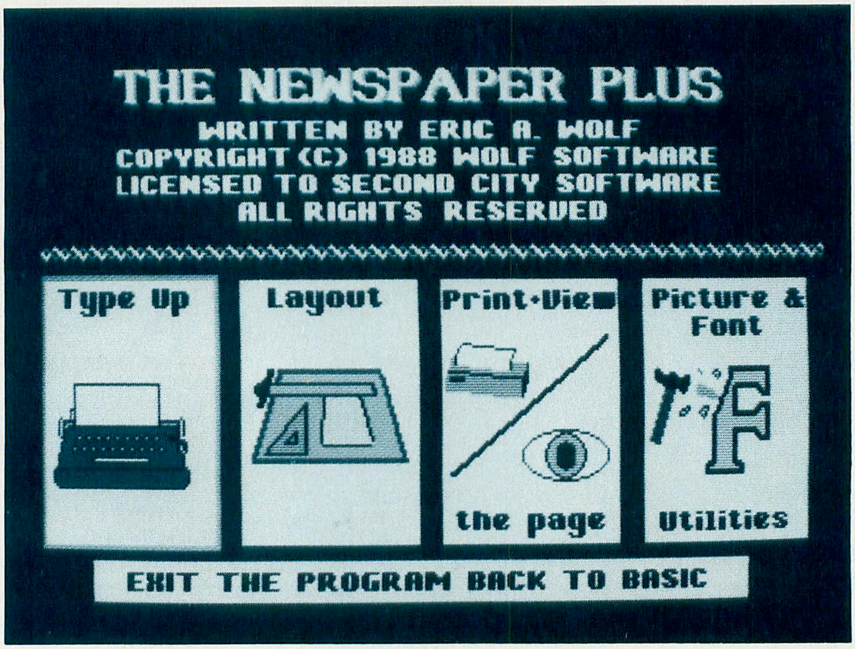

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Software CoCo 3

Newspaper Plus— Affordable Desktop Publishing

So, you think you wanna be in the publishing racket, eh, kid? Take it from me, Chief Editor Harold Times, that you need a computer in this job. What's that? You don't have a PC, just a CoCo? Well, you really don't need a big, noisy old PC! It *is* a CoCo 3, isn't it? Good, kid, that was a smart choice. We've got incredible stuff for this computer now, and some of it is just what the editor ordered! What's that, your typing's slow, and you don't know layout? Don't worry, with this super-duper software you really don't need any of that. If you can push a space bar and press an arrow key, you can be a publisher — right from your own desktop! Yeah, I'm serious, kid. I'll show you. Let's take a little tour around *Newspaper Plus*. . . .

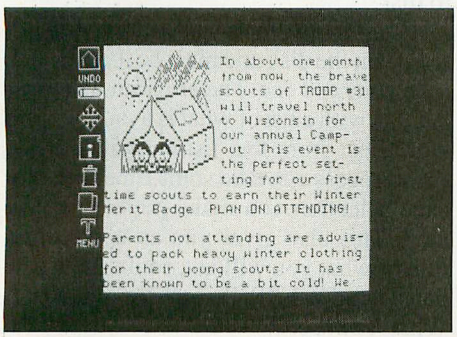
It all starts with the manual! If you aren't sure of yourself, read the five-page *Newspaper Plus Starter Manual*. It'll tell you all about the basics of configurations, picking a printer, all that stuff. It's well worth the reading, because it gives all the information you need to be up and publishing in short order. The manual won't tell you everything you need to know about the *Newspaper Plus* system, but it will tell you more than enough for you to get the feel of the program — even explaining what to do if you run into trouble.

Documentation isn't everything, but it counts for a lot. You have to have thorough documentation, or you get stuck fast. *Newspaper Plus* has good documentation. Very thorough, and very easy to follow. Listen, kid, if I can understand it, anyone can. What's that? You found a typographical error and a few grammar problems? Look, kid, this isn't Shakespeare — just read the book, and don't complain. You can understand it, right? Good. No sir, a few typos never hurt anyone. I made one, once. Now look, kid, you sit here in front of the computer (this is the main menu) and try your hand. Don't be nervous, it won't bite. Go ahead and try it out. . . .

Under the Hood

Newspaper Plus comes out of the package with 22 fonts and 50 clip art pictures. There is a graphics disk you can purchase for $19.95 that has 10 new fill patterns, three new fonts and 50 new graphics picture files (clip art). *NewsArt A-Z* disks are available full of clip art for $9.95 each or

$100 for the whole 26-disk set. While that may not be all the clip art you'll ever need, it is an exceptional value considering the amount of the high-quality clip art you get.



In about one month
from now, the brave
scouts of TROOP #31
will travel north
to Wisconsin for
our annual Camp-
out. This event is
the perfect set-
ting for our first
time scouts to earn their Winter
Merit Badge. PLAN ON ATTENDING!

Parents not attending are advis-
ed to pack heavy winter clothing
for their young scouts. It has
been known to be a bit cold! We

Newspaper Plus supports enough printers to satisfy all but the most eccentric users. Drivers for all the Radio Shack Printers including the CGP-220 (monochrome) and even the Tandy LP1000 laser printer are standard with *Newspaper Plus*. Since in many ways the quality of your printed documents can make or break a desktop publishing package, the LP1000 support is a "sleeper" feature. Support for Gemini, Star NX-1000 and IBM/Epson compatibles is included. There is also a utility that allows you to design your own printer drivers (this utility is no Franken-

Extra, Extra!

One exciting thing about computers and software is that they are forever changing. New hardware — more memory and better graphics — are always just around the corner. The same can be said for software. Programmers change, learn new techniques, perfect the software they write, try out exciting new ideas. The users, of course, reap the rewards of these creations and advances.

The CoCo Community is no exception to this rule. As the programmers in the Community learn more and more about the power of the CoCo 3, and as the new CoCo becomes more and more readily available, exciting new programs seem to be bursting on the scene with every new issue of THE RAINBOW. *Newspaper Plus* is one such program.

It used to be called *CoCo Newsroom*. Then it was called *Newspaper*. It is actually the *Newspaper Design System*, and it is officially titled *Newspaper Plus*.

According to Ed Hathaway, co-owner with David Barnes of Second City Software, exclusive distributor of *Newspaper Plus*, an upgrade called *Newspaper Plus Final Edition* (current working name) will be introduced at RAINBOWfest Somerset in October of this year. However, Eric Wolf, author of *Newspaper Plus*, expects the program to be ready by this summer.

There are to be several significant improvements to *Newspaper Plus* in *Final Edition*, including (but not limited to) the following:

- an ASCII Import/Export utility
- the ability to justify text left, right and center
- support for word wrap around figures and at the ends of lines
- five additional layout designs
- banner stacks as a layout option
- support for the DMP double-strike mode
- the ability to shrink and enlarge graphics
- a built-in two-drive RAM disk for the 512K CoCo 3

For registered users of *Newspaper Plus*, the upgrade to *Final Edition* will cost $19.95, and upgrades will be available at RAINBOWfest. ❑

Graphics, Word Processing and Desktop Publishing

There seems to be a lot of general confusion about what the real differences are in desktop publishing, graphics design/editing systems and word processing systems. As programs become more and more advanced and contain more and more features, and as several packages are put together to form "bundled software packages," much confusion can result about what a program does have or should have to make it a good value.

The key word and essential ingredient to desktop publishing is *integration*. In order for a desktop publishing package to be the real McCoy, it has to have the capability to integrate text and graphics onto a single printed page. Most people associate desktop publishing software with the capability to generate a newsletter, and while this may not be the desired product, a newsletter is a good example of mixing text and fonts and typestyles with graphics in different places on the same page.

Now, a graphics designer/editor can mix text and graphics, true, but it is by far more oriented toward graphics. Graphics, or simply "pictures," are the main goal of a graphics program. You would not want to type a page of text like this one in a graphics program such as *CoCo Max III*. You might want to draw a spectacular sunset and put special lettering under it to show a special scene, but you would be concentrating your efforts into making the sunset as spectacular as possible.

By contrast, while you might write an article, a book report or a proposal with a word processor, you would not expect to insert the same spectacular sunset into a corporate report on earnings for the last quarter of 1988. Things like right justification, table of contents, global search and replace, marking blocks of text, repeating keys and five ways to delete a paragraph would be uppermost in your mind.

But if for that same corporate report you wanted a sketch of the new headquarters building and some graphs of an increase in earnings for the last quarter, you would likely take the text you needed, the sketch and the graphs, load them into a desktop publisher, and then produce your corporate report. It is this relationship between the graphics images and the text that makes desktop publishing so important.

The way to find the desktop publishing software that is right for you is to find a product that supports the features you know you need to have — or the one that comes closest. It is always best to use the formula of "need must justify cost" when considering a new purchase. If a product has 50 features you will never use, it may not be the right one for you. It is also important to be armed with the knowledge of what you want and what you need, as well as what is available when you go out to spend your hard-earned dollars.

If you keep in mind these basic differences between graphics editors and word processors and the blending and integration of the two with desktop publishing, you can make an intelligent, informed decision and get an excellent product at an exceptional value. ❑

stein, either; the easy-to-use menu-style printer driver program could be used by even a novice).

Newspaper Plus uses the keyboard only for input — no mouse driver here. The process is very easy and quickly becomes comfortable. You mostly use the space bar, BREAK key, arrow keys and text-entry keys. I am a die-hard keyboard user, but I think that a mouse/joystick interface would enhance *Newspaper Plus*, in both speed and convenience.

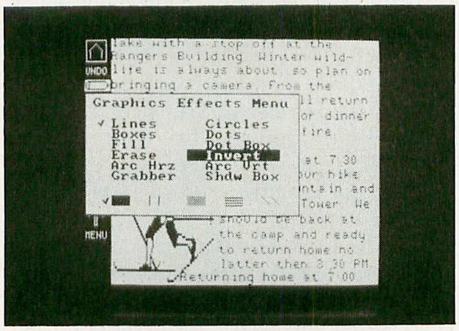
The philosophy behind *Newspaper Plus* is a modular one. There are four distinct "programs" or modules (Type Up, Layout, Print/View and Picture & Font Utilities), and you enter and exit them back to the menu to perform specific tasks in building your documents. Users will spend most of their time in "Type Up." This is where graphics images are stamped onto a screen, text is added and drawings are rendered. The whole screen in Type Up, which *Newspaper Plus* calls a panel, is saved to disk to become a part of the "big picture," which is of course the rest of your document.

A really nice feature of Type Up, which I have unofficially dubbed "the worksheet," is a second blank screen that can be switched into and out of, so that you can actually edit two panels at once, or swap panels back and forth. This is a real timesaver! This is also where the bulk of your saving and loading will take place, whether font, file, graphic image or panel.

The Layout module lets you select the page format for your document (for example, two columns and a banner at the top and bottom), and the Print/View module compiles a document for viewing and printing.

The Picture & Font Utilities module lets you reconfigure your options for the system and translate other graphics files into the *Newspaper Plus* system. This includes a handy utility called *Grabber*, which serves to grab graphics images off a screen to be stored for later use in a document. *Grabber* can also be used from the Type Up module. A warning: Many images you import will be too big for the layout screens, so you may end up importing it in sections or bringing in just part of it. There is no resizing utility in *Newspaper Plus*; when you first bring in an image for inclusion in a document you must decide how big it will be or how much of it to keep.

Two other utilities are provided for editing shades and fonts, which basically means you can create your own graphics patterns and fonts. These take a while to get the hang of, but if you are artistically inclined, they can go a long way! Imagine, you might never have to buy another font (if you have enough patience!). If you reconfigure your system, you will be dumped back to BASIC, and will have to restart the computer and the system. Anything in memory at that time will of course be lost, so don't experiment with the configurator unless you don't mind losing anything in memory!



lake with a stop off at the
Rangers Building. Winter wild-
life is always about, so plan on
bringing a camera. From the
ll return
or dinner
fire.
at 7:30
our hike
ntain and
Tower. We
should be back at
the camp and ready
to return home no
latter then 3:30 PM.
Returning home at 7:00.

A Spin Around the Block

The Type Up module is the key to the entire system. Its screen resembles something you would see in a graphics program: To the left there are icons for the various tools available, including a stamp for stamping graphics images into a layout, a Disk icon for saving and loading, an Undo icon in case you make a mistake, a Trash Can icon to get rid of mistakes you didn't undo, and an option for the main menu. There is also a Pencil icon, and this will open up its own screen with more icons for drawing — lines, circles, arcs, boxes, fill patterns, even shadow boxes.

Unlike other desktop publishing programs, the idea behind *Newspaper Plus* is that of a very structured process. Picture a big news office with different departments for layout, design, printing, special effects, repairs, maintenance, etc. This is the theory behind the *Newspaper Plus* main menu.

Another major difference with *Newspaper Plus* is its newsletter orientation. You don't have a blank page to work with, you have several blank areas on a page. These are chosen in the Layout section, where you are limited to four choices for how you want your particular creation to appear. With *Newspaper Plus* there is a fixed format of blocks that must be designed around. Naturally, one block can connect to another. This takes time and a lot of effort, however. It would be very difficult indeed to try a cross-panel diagonal going up and down a page.

As far as text editing goes, it's your basic type-it-or-erase-it system. You can work text in and around and even over the clip art if you like, but the extent of word processing here is "type it" or "erase it." Even erasing takes some work! One nice feature is that *Newspaper Plus* assumes that you are typing in columns, and will position your cursor correctly for the next input. Other than that, you are on your own.

Once you have built all your separate panels, you go into View/Print, compile the document by retrieving the separate panels, and then view it, print it or save it to disk.

Graphic art, fonts and fill patterns all reside on the disk and must be loaded each time you need one. The program will present you with a list of what is available, and you select from that list or switch disks. This process can take some time, because each selection you make requires a disk load. This also gives you an approximation of what you will get, so it can also be considered WYSIWYG (What You See Is What You Get).

Newspaper Plus has the best documentation for desktop publishing on the CoCo that I have seen. It includes a thorough manual, which is easy to comprehend, and a getting-started tutorial to introduce you to the program and how it works. In addition there is the *Newspaper Plus Tribune*, which is published quarterly by Ed Hathaway, which includes patches and upgrades, information for users, newsletters others have assembled, new release information and more. This is one giant leap for user support! The first such issue printed an important patch for DMP-105 printers.

The *Tribune* is provided free of charge to registered *Newspaper Plus* users. Unfortunately, I did notice a good number of typographical errors and some grammatical and syntactical problems, but these will not confuse the user.

What *Newspaper Plus* Cannot Do

Newspaper Plus cannot rotate, shrink, stretch or in other ways manipulate graphics images. It *can* move them around on a graphics page, but it has limited importing capabilities. If you are looking for a graphics design program, keep in mind that this software is specifically written to manipulate and present graphics, not edit or create them.

Newspaper Plus is geared toward presenting graphics and text in a structured layout on paper, and thus it focuses on graphics that have already been edited. That is not to say that *Newspaper Plus* is devoid of graphics handling — there is the capability for lines, circles, boxes and arcs, those essential tools of shapes and forms. There are numerous fonts available for text, and there are many fill patterns for the graphics. If one considers that the graphics-editing capabilities of *Newspaper Plus* are there primarily to enhance the images (clip art) used and to emphasize text, the graphics are entirely adequate.

Newspaper Plus has no text importation utility. This means two important things: The first is that *Newspaper Plus* is geared for only limited amounts of text, and the second is that *Newspaper Plus* is incapable of importing text created on another word processor or other outside source. Because *Newspaper Plus* has limited editing capabilities, it means the user really should have a good idea of what he wants to say on paper before sitting down to some serious keyboard blasting. It also means the user should know what font he is intending to use, for this will have an effect on the amount of text that will fit in a graphics panel or page.

Of course, if you plan carefully, the panels can be linked on a page to flow from side to side — or even newspaper-style from column to column — which means that text-linking is relatively easy to handle.

Putting It All Together

In the final analysis, *Newspaper Plus* is a versatile, sophisticated, user-friendly program. Because of some of its extra features, like a startup/tutorial manual, a graphics grabber program, a font and shade editor, *Newspaper Plus* is a powerful package. It has compatibility with *CoCo Max III* and any `PMODE 4` graphics-generation program, and nearly anything else you can throw at it. The *Graphics Disk I* and *Graphics A to Z* substantially complement the package.

Newspaper Plus is slightly limited by its idiosyncrasies, such as allowing users to grab only a partial or small image. It is also limited by the lack of a text-importation utility, no mouse/joystick interface and some limitations in layout design. These limitations, however, are workable and not particularly user-hostile.

A May 1, 1989 release of *Newspaper Plus*, sporting substantial work on error-trapping routines, has corrected earlier flukes and bugs in the program (such as crashing on graphics saves when the disk being saved to is a bad disk).

The bottom line, as I see it, is that *Newspaper Plus* is a solid, reliable program, easy to use, and one that will certainly get the job done. The added support of Second City Software and the *Newspaper Plus Tribune* make this desktop publishing package an excellent value to anyone needing desktop publishing for the CoCo.

(Second City Software P.O. Box 72956, Roselle, IL 60172, 312-653-5610; $48.95)

—Jeff Parker

Software CoCo 1, 2 & 3

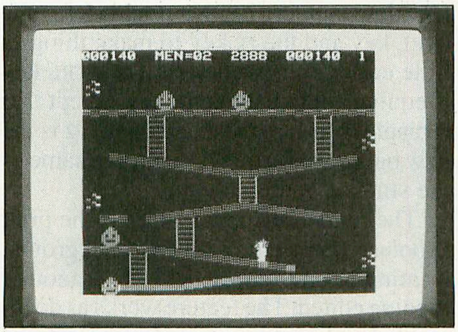
Mutant Miners— Chased by Mutants

Mutant Miners is a game written for all models of the Color Computer. It resembles the popular *Donkey Kong* arcade game in that players have to climb various chutes, ladders and elevators.

Mutant Miners requires a minimum of 32K RAM, Extended Color BASIC, a disk drive and a joystick. It can be played by one or two people and utilizes colorful Hi-Res graphic screens. Speed of play is adjustable from 0 to 9, with 0 being the easiest. CoCo 3 users can run `BOOT3`, which enables the high-speed poke.

The game is written to support only composite video, so CoCo 3 users with the CM-8 Tandy monitor will only get a black-and-white picture. I tried it on my Amdek color composite monitor and was impressed with the colorful graphics. I'd like to see it support RGB monitors, as well, which would provide even sharper images available on the CoCo 3. The software, supplied on a single 5¼-inch disk, is not copy-protected; making a backup copy for your own protection is not a problem.

Mutant Miners contains a total of 10 screens that must be completed in succession. After all 10 are completed, you are advanced to the next level of difficulty. While loading a screen, the program displays the player number, the screen number and the current level of play. It then waits for you to press the joystick firebutton to begin. You can press the P key at any time to pause the action while you gather your wits and plan your strategy. I used this feature a lot!



The game scenario involves an abandoned uranium mine inhabited by mutants. A network of interconnecting grids has either collapsed or was never completed during the mine's heyday.

You will encounter rickety ladders, missing planks on walkways and uranium deposits. (The uranium deposits provide you with increased temporary strength that is lethal to the mutants who try to block your progress.) You are able to jump obstacles as well as slide and ride both horizontal and vertical transporters. You will learn early on that many of the available movements allow passage only in one direction, so you will have to plan accordingly. The touch of any of the mutants is deadly, and your temporary strength lasts a very short time.

Mutant Miners is a lot of fun to play. I've spent many pleasant hours with my 12-year-old daughter trying to get through all 10 screens. The game is very challenging and by no means will you be able to complete it quickly.

(JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, 805-735-3889; $19.95 plus $3 S/H)

—Jerry Semones

Software CoCo 1, 2 & 3

Hard Drive Zap— Zap Your Troubles Away

Have you ever had to face a crashed hard drive caused by a head "banging," a power surge, or even by a mistake you possibly made? Unfortunately, many of us have had to deal with such problems. As you might know if you're a hard drive owner who's suffered crashes, file damage usually occurs when these things happen. *Hard Drive Zap* will make recovering damaged files or crashed hard drives much easier.

Hard Drive Zap is a part BASIC, part machine language program that will run on any Color Computer 1, 2 or 3 with 64K memory and Extended Color BASIC. It's designed for use with the Burke & Burke *Hyper-I/O* operating system. The program is fully commented, so making modifications to suit your personal computer system can be done painlessly. This software does not support the OS-9 operating system.

To get started, all you need to do is simply enter `RUN "HDZAP.BAS"`. Once it's booted, a data window will appear in the center of the screen showing 256 bytes of disk data. At the top of the screen you will be shown several pieces of information (the device you are presently accessing, the current track and sector of the device, etc.). You will also be shown the cursor position in the data window *along with the*

ASCII, decimal and hexadecimal value of the character located under the cursor. By pressing the left and right arrow keys you can move across the sectors on the current track. You can also change the current track just as easily. Want to move to another device? It's easy. Multiple-drive owners no longer need to exit the software and manually switch devices!

Modifying information in the data window couldn't be any easier. Simply move the cursor to the data you want to change and enter the change. Your modification will not be saved to disk until you give the command to write it. This is a super feature that can save you if you accidentally enter the wrong information.

This software package comes with excellent documentation. It also includes a helpful document explaining in full detail how to recover damaged files or disks. Although this software claims to be a hard drive zapper, I've found it works great on my floppy drives also. The software comes on an unprotected 5¼-inch floppy.

Make lost file recovery a cinch with *Hard Drive Zap*.

(KB Enterprises, 435 Brightwaters Drive, Cocoa Beach, FL 32931, 407-799-3253; $21.95 plus $1.50 S/H)

—Brian R. Smith

Software CoCo 3

VIP Calc III— Calculating Up Memory Lane

Sooner or later almost everyone has a need to do spreadsheet calculations. If you are lucky enough to own a CoCo 3, then you will be pleased to know that SD Enterprises has upgraded *VIP Calc* for you.

When I opened the *VIP Calc III* package, it was like greeting an old friend. Here was an upgrade to one of the programs I bought shortly after I got my first CoCo. I remember *VIP Calc* was the best deal I could find for my purposes, so I scraped the money together and bought it. I was interested to see if the upgrade for the CoCo 3 was the same quality product.

VIP Calc III is a full-featured spreadsheet program based on a product that has been around awhile, and it has benefited from that relationship. While it is possible to introduce bugs when revising software for a new machine, SD Enterprises has managed to avoid adding any to the existing spreadsheet functions. The only "bug" I found was that the arrow keys do set a value into a data cell even though the manual insists that the ENTER key is required. Instead, SD has retained those features while making use of the CoCo 3's features.

Most of the new features involve use of the CoCo 3's built-in high-resolution displays rather than using software to provide the larger displays. The 85- and 54-character modes are gone, replaced by the 40- and 80-character modes. The 32- and 64-character modes remain, but they are now just trimmed versions of the 40/80 character modes, and use the same character sets.

The number of lines on the screen is fixed at 24. Also, you can now set colors for the foreground, background, cursor and highlights rather than just toggling between green and white or inverting the colors. If you have a composite monitor, you can set the display colors off (mono) or on (color). Since the high-resolution displays no longer consume memory needed for data, the *VIP Calc* "Dump" command is no longer needed.

All cassette support is sacrificed to provide more room for data, as well. While this is not a feature most people will miss, any *VIP Calc* files you have on tape will have to be converted to disk before you can use them with *VIP Calc III*.

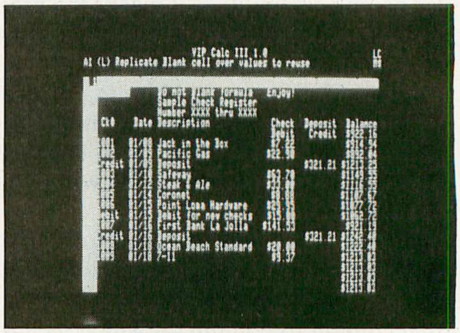
VIP Calc III does provide new menu displays that summarize the commands and make the program easier to learn. The command menu is displayed any time you enter the Command mode, including when you first enter the program. The spreadsheet menu is displayed when the CTRL key (not CLEAR) is pressed. Help is still provided in both modes but needs to be referenced less often.

If you are upgrading from a CoCo 1 or 2 and *VIP Calc*, you will find that all the keys work basically the same in *VIP Calc III*. New support has been added for the CTRL key and the F2 key to make things a little easier on newcomers. The CTRL key is equivalent to the CLEAR key except that it displays the spreadsheet menu. F2 is the new backspace key and works the same as the SHIFT-@ combination.

The remaining new feature is the print spooler. This feature allows background printing of one spreadsheet while another is being edited. The feature works as documented and is a timesaver if you are doing several spreadsheets or trying out what-if projections.

VIP Calc III comes with a sample spreadsheet to balance your checkbook. The sample works and can be used to actually track your checkbook if you want.

The documentation is the biggest clue that this is an upgrade. It consists of the documentation for *VIP Calc* and a four-page supplement outlining the changes to commands and new features for *VIP Calc III*. It still does the job, providing both tutorial and reference sections. You just need to read the supplement first and write in a few changes to the base document as needed. It would have been nice to have a totally new manual, but I've seen worse solutions.



```
VIP Calc III 1.0
A1 (L) Replicate Blank cell over values to reuse
```

SD Enterprises does not break a lot of new ground with *VIP Calc III*, but it is a solid product with most of the features you will need. People who use MS-DOS computers may find some features lacking, such as support for graphics, pie charts and the like, but *VIP Calc III* competes well, especially considering the tenfold price difference. For those of you who already have *VIP Calc*, SD Enterprises is advertising an upgrade at a reduced cost ($29.95).

Although I had no problems with the package, SD Enterprises does offer customer support for registered users. No toll-free number is provided, so you will pick up the tab for any calls.

VIP Calc III requires a Color Computer 3 with 128K and at least one disk drive. The package will work with a TV, composite or an RGB monitor.

(SD Enterprises, P.O. Box 1233, Gresham, OR 97030, 503-663-3865; $69.95; $29.95 for upgrade from *VIP Calc*; add $3 S/H)

—Jesse R. Strawbridge

Software CoCo 3

Omni Utility— A Multi-Talented Application

Who can make backups of entire disks in three passes, index a disk by pressing two keys, and leap tall buildings in a single bound? Well, maybe I got a little carried away with the tall building, but the other two operations and 14 more can be done by *you* if you have *Omni Utility*.

Omni Utility is a disk utility written by Greg Wittmeyer and sold by GSW Software for the CoCo 3. *Omni* comes on an unprotected disk, accompanied by an eight-page booklet that explains how to use each option.

The purpose of a utility is to make life easier on the user, to help him or her perform a task faster and with less work, and *Omni* does this very well. Anyone who has copied a large number of files knows the joy of typing filenames, extensions and machine addresses, but none of that is necessary with *Omni*. Single-drive owners know every time they type `BACKUP0` they are about to change disks seven times (it just seems like more), but *Omni* will do it in three passes. *Omni* will also allow the user to open a disk and modify it.

When *Omni* is first booted, a nice-looking title screen comes up. At this point the disk you want to work with should be inserted into the drive; after a key press, a menu screen appears. On the right side of the screen is a box with the directory of the disk to be worked on. On the left is a list of 16 commands. The arrow keys are used to choose a file; a single key press executes a command. To work on a different disk, simply put it in Drive 0 and press BREAK.

Omni's options include Backup, Copy (single program), Execute file, List (contents of file), Format, Information (type of file, number of granules, which granules on disk, format of file), Kill file, Move file, OK disk (verify a section of disk), Print directory, Alphabetize directory, Rename file, Update directory, Verify (*Omni* verifies what it writes), Quit and Sector editing.

The sector editor is a powerful utility that allows the user to go into any track and sector, read it and change it, if he wants, with the options of Jump (to different track and sector), Modify and ASCII (toggles ASCII).

I feel *Omni* is well-written and does the job it is designed to do. The only problem I encountered was with printing the directory. The first directory I tried to print came out garbage (I run a digital printer at 4800 baud). So I shut the program down, typed in `POKE 150,7` (set baud rate to 4800) and the directory printed beautifully. The only suggestion I would have to improve *Omni* would be the ability to access two drives.

All in all, I really liked *Omni Utility*. It is easy to use and saves so much time, especially on single-drive systems. And I believe anyone with a disk drive system could put *Omni* to good use. Whether the user just uses *Omni* to index, back up, copy and print directories, or he knows enough about programming to use all of the options, *Omni Utility* is more than worth the price, and a good program to have. Then find a tall building. . . .

(GSW Software, 8345 Glenwood, Overland Park, KS 66212, 913-341-3411; $20)

—Steve Griffith

Software CoCo 1, 2 & 3

The Wheeler— Theory of Sums

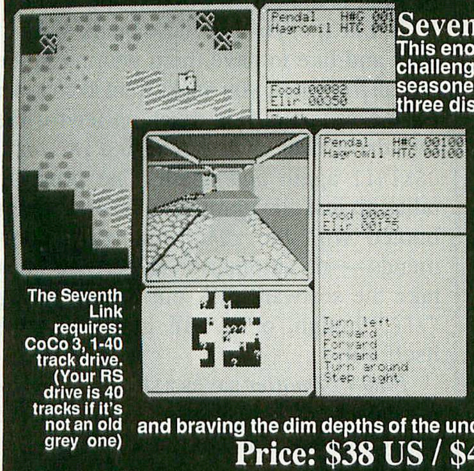
Lottery addicts, read on! If you want a new way of selecting numbers for your Lotto bet, this utility will help you. In addition, there is a game function that will make six "quick picks."

When I started reading the documen-

New For The CoCo 3

The Seventh Link

This enormous epic will challenge even the most seasoned adventurer. It's a three disc monster with spectacular 3D dungeons filled with creatures, ladders, flooded rooms, chests and pits. You must create a brave character, be he fighter, thief or magician, and adventure through the wilds of Elira, battling monsters and pirates, searching towns and castles, sailing uncharted waters, and braving the dim depths of the underground.



The Seventh Link requires: CoCo 3, 1-40 track drive. (Your RS drive is 40 tracks if it's not an old grey one)

Price: $38 US / $48 CDN

Studio Works

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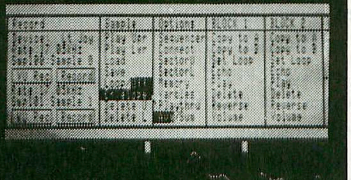

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tation, I found the theory fascinating. I'll call it the "Theory of Sums." Derived from statistical analysis, it involves selecting a group of numbers by the sum of its parts. The author is a Californian who used the Lotto 6/49 data to develop and illustrate his theory, but the program can be used for any Lotto version. Since I am a Californian, I have a complete file of the numbers drawn even though I do not bet. The file is for the benefit of others who *do* bet and comes in handy at times like this.

The author's statements do check out. I must make it clear that this is not a "system." It *does not* use numbers from the past. The player must supply a group of numbers that are then processed by the program according to rules set up by the player. A list of "wheeled" numbers is produced. The actual program will be discussed later.

This theory of choosing numbers was so impressive that I consulted with my son, a mathematician. Besides having a master's degree in math, he is a confirmed Lotto player. He was quite taken with this theory, too. He uses the family birthdates, which add up to 92, somewhat less than the average given in the theory. He actually did change his number selection one time to increase the sum, but it didn't win, either, so he returned to his original numbers.

After some calculation and much thought, he said the average of the sums will probably be 150 after enough drawings have occurred. The sum will be in a range on either side of 150, because there are more ways to add to these sums than to higher and lower sums. (In California, the maximum sum is 279 and the minimum is 21. Actually, the highest sum to date is 231 and the lowest is 73.) Therefore, the Theory of Sums is probably no more valid than other theories that seem to work. Valid or not, it might still change your luck!

Now, on to the program. It is nicely presented, works well and is adequately documented. The user is asked to type in the highest number used. In California this is 49, but any number can be used. The user is protected against entering invalid numbers later. The next thing is a query as to the number of digits used (six in California). Finally, it wants to know if a printer will be used.

At this point, a menu of options appears:

1. High/Low Limits — sets the range of sums to be considered. If a range is not chosen, the list is very long (too long).
2. Specific Total — allows choosing of a specific sum; all other groupings will be eliminated. Maybe the superstitious would do this, but I found the actual Lotto sums varied a lot and don't recommend it.
3. Max. Evens/Game — sets the maximum quantity of even numbers to be used in a group. It defaults to 0 if chosen and no number is input, so care is advised.
4. Del 0/1 Even Games — deletes groups that contain five or six odd numbers. Draws containing five or six all odd or all even numbers are rare.
5. Key Number — lets the user enter a number that will appear in all groups produced.
6. Print to Printer — outputs to the printer instead of to the screen. It does not work with both at the same time. Another option to print will appear after the screen version, and I used that opportunity to make printouts. At that point, I knew the printout would be useful. Some of my attempts resulted in very long lists that I did not want to print.
7. Print to Screen — automatically selected until Option 6 is chosen. Note as stated above, an opportunity to print follows.
8. Limit Screen Prints — only seven groups at a time will appear, and the user can abort if the list is too long. If this is not chosen, the screen will scroll continuously.
9. Enter Wheeling Numbers — the last step. A short menu appears, advising the user to enter 7 to 19 numbers. The more numbers entered the more results generated. The program will automatically check that all numbers are valid and none are repeated.
10. Pairs Option — allows outputting of games that have two consecutive numbers.

There are two more commands available: 'E' exits the program and C allows the game parameters to be changed (that is, to use a different version such as 5/39 instead of 6/49). This is for the benefit of those who play Lotto in more than one state.

`GAMEGEN.BIN` is the "quick pick" version. The procedure is the same except that no provision is made for "Key Number" or "Limit Screen Prints." Six random games will be output to the screen or printer.

While at first we were very impressed by the theory, we came to the conclusion that it was more interesting than valid and that the program really does not do much to improve the chances of winning. It just provides a different approach to choosing numbers. Winning is still a matter of luck.

We agreed that the program does work well to produce lists of numbers "wheeled" as advertised, but the user must supply the numbers. The first program is a BASIC loader for the machine-language program, which is very fast. I did make a backup copy to use, and there is a copy of the documentation on the disk. The author offers a warranty for 90 days — a malfunctioning undamaged disk will be replaced free. After 90 days, there is a $5 charge.

The program requires one disk drive and will work on all versions of the CoCo.

(Davisson, 13733 Celestial Road, Poway, CA 92064, 619-748-7441; $12.50 plus $2.50 S/H)

—Audrey DeLisle

Software CoCo 1, 2 & 3

Fast Formatter— A One-Trick Pony

Over the years, I've found that utility programs fall into two basic categories: the Swiss-Army-knife-type utilities that do, or try to do, just about everything, and those programs that accomplish only one function as quickly and as simply as possible. *Fast Formatter* by M. David Johnson of BDS Software is an example of the latter. Its sole purpose is to format two single-sided disks in succession, which it does, but that is the extent of its scope.

If, like me, you purchase blank disks in bulk and like to have them waiting in the box all formatted, you might want to consider *Fast Formatter*. It is much easier for the two-drive user than typing `DSKINI0` and `DSKINI1` again and again. The program takes up just one granule on its disk and is booted with the `LOADM` and `EXEC` commands — no automation there. You must take the software disk out before typing `EXEC`, though, or it will gleefully wipe itself out.

Fast Formatter saves a step in initializing pairs of disks. While no faster than the `DSKINI` command (`DSKINI` takes 40 seconds to initialize one disk; *Fast Formatter* takes 80 seconds to format two), it does save a lot of keystrokes, a serious consideration for the price; at only $5, you will not find less expensive disk software anywhere.

The documentation supplied with *Fast Formatter* is both brief and complete. Part of the charm of this kind of utility is its simplicity, and M. David Johnson's instructions leave no doubts, even for beginning users.

There are a few limitations to this program. One is that it is hardware-specific: It requires two and only two drives. I tried unplugging one drive, and while *Formatter* still functioned, it gave me an I/O Error when it tried to access Drive 1. Nor is there any screen acknowledgement that anything is going on. After you type `EXEC` the drives whirr, but nothing shows on the monitor until the cursor returns after formatting. My only other quibble is minor. Had I written this utility, I would have added a loop to prompt the user to run it again, something like, "Hit any key to continue." As supplied, the user must type `EXEC` and press ENTER for each new pair of disks to be formatted.

Fast Formatter is a one-trick pony, but it performs its trick flawlessly. If it will fill your needs, you should consider it for your collection. It provides a simple service at a bargain price.

(BDS Software, P.O. Box 485, Glenview, IL 60025, 312-998-1656; $5)

—Fred Toon

Software CoCo 1, 2 & 3

Nine-Digit Calculator—Reverse-Polish CoCo

In the early days of hand-held calculators, you could spend hundreds of dollars for a four-function model. No memory. No fancy functions. Just add, subtract, multiply and divide. My first such electronic marvel cost $150, but I was the envy of everyone I knew because it could also do square roots. Of course, it was obsolete almost before I could scrape the price tag off, but it came along just in time to save me from having to learn to use a slide rule.

As calculators became more popular and powerful, it wasn't long before programmable models entered the market. The move was on to make calculators function like computers.

Nine-Digit Calculator, from BDS Software, is a program that does exactly the opposite: It makes your Color Computer function like a calculator. It is written entirely in BASIC and runs on any model Color Computer.

Nine-Digit Calculator uses Reverse Polish Notation, in the manner of Hewlett-Packard calculators. The screen display consists of the values in each of the six stack registers, and an entry "pad." As you key in a number, it is displayed in the pad. Pressing ENTER moves the number "up" the stack into Register R0. As each additional number is keyed in and entered, the values move up the stack. Operations are performed on the values in R0 and the pad. For example, to add 10 and 5, you would type in 10 and press ENTER, placing it in R0. Then you press 5 (which is displayed in the pad) and then +. The two values are added together, and the result is displayed in R0.

This type of notation takes some getting used to, but it is very fast and flexible. If you are an experienced HP calculator user, you'll find using *Nine-Digit Calculator* is quite simple. If not, you will need some experimentation time initially.

In addition to the standard functions, *Nine-Digit Calculator* supports an ample array of operators and functions, along with 100 internal memory locations. With one or two keystrokes you can move the stack up or down, clear the stack and pad, save to or recall from any of the memory locations, enter numbers in exponential notation, round off values, or set the number of decimals in the display. With a few extra keystrokes you can invoke any of 18 functions, including trig functions, logs, absolute value, square roots, truncation and random number generation.

All of the operations and functions perform smoothly, and the inherent speed limitations of BASIC are not annoying. The screen display is easily read, and the entry of operators is facilitated by not requiring the use of the SHIFT key for normally shifted characters, such as * and +.

The documentation for *Nine-Digit Calculator* is clear and concise, covering all available functions and operations and any potential error messages they may generate. Despite considerable banging on this

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program, I couldn't make it fail in a way not described in the documentation. There is also a convenient one-page summary of all commands, which is all you need once you've made an initial pass through the write-up.

There is really *nothing* about this program that is particularly positive or negative. The 100 memory locations seem positive, but I rarely use (or want) more than five on any calculator. The number of functions is not impressive, but "impressive" and "useful" aren't always synonymous anyway. The bottom line on *Nine-Digit Calculator* is that if you already have a calculator you're happy with, you won't need this program. If you don't, it offers basic calculator functionality for a very minimal cost.

(BDS Software, P.O. Box 485, Glenview IL, 60025, 312-998-1656; $10)

—Jim K. Issel

Software

CoCo 2 & 3

Notes— At last, a "Word Processor" for Musicians

You've just put your latest musical masterpiece to paper, carefully drawn the last clef, added all the sharps and flats, and neatly erased and rewritten all those mistakes you made. Is your musical transcription ready for the band? . . . for the publisher? Or are you the only musician in the world who can read your own handwritten transcriptions?

Sing the blues no longer, because your CoCo has a solution that will be music to your ears if you have *Notes* — a music "word processor" for the CoCo 2 and 3 that can save you the expense of professional typesetting. *Notes* should be called a "music processor," for in the same way a word processor creates neat-looking written text, *Notes* allows you to create, edit and print professional-looking, single-stave music.

Not to be confused with MIDI-sequencing software or a program that generates playable music data, *Notes* is written just for creating printable sheet music. *Notes* requires a 64K CoCo 2 or 3, a disk drive, a television or monitor and a dot-matrix printer (such as Radio Shack's DMP-106). The program comes on a single nonprotected disk.

Notes is a combination BASIC and machine language program. The BASIC program allows for convenient switching between the music editor and disk, and allows printer access. The music editor is written entirely in machine language to make it as fast and responsive as possible. *Notes* is a stand-alone package and cannot read music files created under any other editor.

To start the program, a simple `RUN "NOTES"` loads the BASIC program and the machine language routines into memory. All the features of *Notes* can be accessed from a comprehensive main menu that appears on the familiar 32-column green screen (*Notes* does not take advantage of any CoCo 3 features).

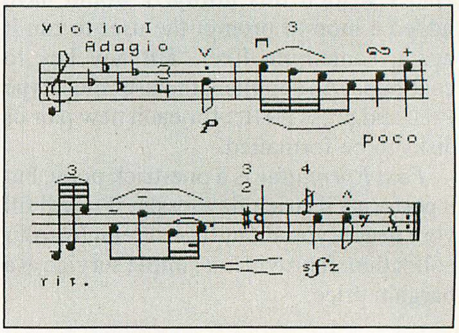
The main menu allows single-key access to the editor, disk I/O, printer output and configuration, and a special utilities section that allows for the adjustment of program parameters. File management options include easy file viewing, loading, saving, deleting and renaming. The main menu also keeps you constantly advised of how much disk space you have remaining.

Enter the music editor and you are presented with a blank music stave and a flashing cursor on the buff and black `PMODE 4` screen (a "stave," also called a "staff," is the standard set of five lines used for positioning notes). One stave is the maximum the editor allows you to work on at a time.

The stave length represents one stave of music as it will appear printed on 8½-by-11-inch paper. Each stave can be divided by as many measures as you want, wherever you want, or each stave can be preset to contain from two to seven equally spaced measures. Depending on your printer, you can print from seven to eight staves per page. Be advised that the editor does not allow for the connecting together of two or more staves, as is done in piano transcriptions. Because you can't view more than one stave at a time, it would be almost impossible to create a "grand staff," for example, with separate treble and bass clef lines.

If single stave music suits your lyrical purposes, then in *Notes* you will find a cornucopia of music transcription tools. Using the arrow keys to move and position the cursor (the arrow keys auto-repeat) and a few simple keystrokes, an aspiring maestro has instant access to nearly everything musical. There are clef symbols, time signatures, key signatures, single notes, tied notes, dotted notes, triplets, slurs, rests, sharps, flats, double sharps, double flats and naturals, all easily positioned with the fast-moving cursor.

For putting some feeling into your music there is a large vocabulary of musical expressions, including all the standard dynamic indicators (arpeggios, mordants, trills, accents and bow direction indicators). If you need to add a word or two to your composition, text can be inserted as easily as music. If a lot of text is needed, the whole stave can be deleted to make room for a song title and composer, etc.



If you should make a mistake along the way, there is a deletion function for erasing and closing large areas, or the cursor itself may be turned into a large or small eraser for mopping up smaller mistakes. If you've forgotten to include something, music or text can be inserted anywhere on the stave. Other options include a choice of note stem directions, a selection of repeating symbols, and "over" or "under" ties to sustain notes across bar lines.

Overall, I find *Notes* rewarding to use. The only awkward thing about the program is the way it handles files. Each stave of music is saved to disk as a separate file and is named by the number of its place in the music. Each file is basically a disk-hungry, three-granule PMODE screen. On a standard 5¼-inch, single-sided floppy disk, there is room for only 22 staves of music. With between seven and eight staves of music per page, a 10-page composition would require four single-sided storage disks, plus an equal number of backup copies (if you're as afraid of disk crashes as I am).

While having a lot of files is somewhat cumbersome, working with single staves of music isn't necessarily a drawback. While the editor has no block-defining or file-merging features, the individual stave files can be treated as blocks. So if you want to repeat a certain stave later on in the composition, rather than re-entering all the notes, you simply make a new copy of your original stave by saving it to disk under a new number.

Working with a lot of separate files also allows for a great deal of printout control. You print a page by specifying the starting and ending file numbers of the staves you want to print, and this allows you to print a page or portion of a page at a time. I was happy to see that the music printed out exactly as I saw it on the screen.

I found the documentation very adequate, consisting of 16 full double-sided pages of comprehensive, cross-referenced information.

While I noted a few minor bugs (and a tendency for the program to crash if you press inappropriate keys), I have been assured by the author that the currently available version has fixed these bugs and includes new printer drivers and updated documentation, as well.

At times awkward, always intelligent, *Notes* is a comprehensive and feature-packed music editor well worth investigation.

(Robert Pori, 137 Wingfoot Court, Aptos, CA 95003, 408-688-0115; $45)

—Walter Myers

Software

CoCo 1 & 2

DIR-MGR+— Disk Directory Manager

DIR-MGR+ is a disk directory management utility program written for all models of the CoCo, requiring a minimum of 64K RAM. It's supplied on a single nonprotected disk that also contains the program instructions under the filename `DM INS`.

The program's main functions allow you to back up the current directory to an unused granule, write that backup directory back onto Track 17, reposition any filename in the directory, kill any file, rename any file or insert a dummy line on the directory as - - - - - - - - - . - - - -. In addition to all of these features, *DIR-MGR+* also provides a hard copy printout of the disk directory in either two or three columns if you have a printer connected. This is a handy way to keep track of what you have on each disk.

The program loads and runs when you type `RUN "DIR-MGR+"`. You can select high-speed operation at a user prompt. Select N (No) if your computer won't run with the high-speed poke. If you don't know, select Y (Yes): If your computer locks up you will have to reset the computer and rerun the program, selecting N the next time. The program is written in the standard 32-column format but uses colorful screens. The actual working screen is split vertically so that the filenames of the disk you are looking at appear on the left side. Using the up and down arrows, you can scroll vertically through the various filenames past a window where you select the commands.

The program worked fine on both my original CoCo 1 as well as my 512K CoCo 3 (of course, I could not utilize the high-speed poke on my CoCo 1). The lack of added speed does not detract from the software's usefulness. The features contained in this program are not new to the CoCo world, but their use in a menu-driven disk utility is a refreshing aid if you want to ensure you won't lose valuable programs because of dreaded I/O Errors.

I liked the ability to rename and reorient my directories with the simple push of a key. The use of the dotted line - - - - - - - . - - - is a handy way of separating clusters of programs on a disk. If you have ever listed a directory and could not remember all of the files that made up one larger program, you know what I mean and will like this feature.

DIR-MGR+ is a nice utility. It does what it's supposed to do at a modest cost. I recommend this program particularly to new CoCo users. It's written in BASIC; studying the listing would be good practice in programming and learning how the CoCo does what it does so well.

(Mike Forrest, 14030 Peyton Drive, #203, Dallas, TX 75240, 214-239-3541; $14.95)

—Jerry Semones

Software

CoCo 1, 2 & 3

Ultra-Merge— Personalize Your Letters

How would you like to personalize your form letters? Well, now you can with *Ultra-Merge* from Tothian Software, Inc. It will let you personalize letters, forms, etc., using your favorite word processor and database files created by Tothian Software's *Ultra-Base* program. (See the review for *Ultra-Base* in the January 1989 RAINBOW, Page 126.)

As president of the Greater Toledo Color Computer Club, I immediately thought of one possible use for *Ultra-Merge*. Each month, notices for dues are sent out to club members, accompanied by a short letter I've written with my word processor. Normally I would fill in the name and expiration date by hand after the form was printed. *Ultra-Merge* can now take care of that task for me.

To use *Ultra-Merge* you must first enter your word processor and create an ASCII copy of your letter or document, leaving blanks at the appropriate places. When you use *Ultra-Merge* to print personalized copies of your letter, it will fill in the blanks with data taken from specified categories in the *Ultra-Base* files. To sum up, you will need a word processor, *Ultra-Base* and *Ultra-Merge* to create your personalized letters.

The program seems to work pretty well. The only negative thing I noticed was the slowness of the printer routine. If you were doing 40 letters, this could take quite a while. However, I usually only send out five or six dues notices each month, so that doesn't present too much of a problem for me. On the other hand, the search feature and alphabetizing is fast.

I found the program quite easy to use, so easy that I really didn't even need the documentation that comes with the program. In fact, the documentation is only three single-sided pages long. Everything is very user-friendly, and menus take you through it all.

Upon booting up *Ultra-Merge* you will see a six-option menu. At the bottom of the screen you will also see two numbers. The first tells you how many bytes of free memory space exist in the *Ultra-Base* file buffer. The second tells you how much free space there is in the ASCII buffer, where the master copy of your letter is stored.

There are some sample files included that you can use to try out *Ultra-Merge*. One nice feature shared by both *Ultra-Merge* and *Ultra-Base* is BREAK protection; if you accidentally stop the program by pressing the BREAK key, you can continue by typing `CONT` to resume.

Ultra-Merge, along with its companion program *Ultra-Base*, is a nicely designed package. There are more sophisticated database/merge programs out there, but they are also a lot more difficult to use, as well as more expensive. This program is suited to the person who wants a simple, easy-to-use database and merge program to keep mailing lists, rosters, simple inventories, etc. It doesn't require hours of study to use or set up. You can start making those personalized letters and forms right away!

Ultra-Merge runs on all CoCos with 64K. It also requires *Ultra-Base* and a word processor.

(Tothian Software, Inc., P.O. Box 663, Rimersburg, PA 16248; $24.95; $39.95 for both *Ultra-Base* and *Ultra-Merge*)

—Robin Jackson

Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, *your assurance that we have seen the product and have ascertained that it is what it purports to be.*

Ⓕ **4MOST Advanced Utilities for OS-9 1.01**, a set of four utilities that supplement OS-9: `Shell` and the commands `CP`, `MV` and `Print`. `Shell` does its own wildcard processing and allows parameter passing. `CP` and `MV` handle file manipulation, and `Print` gives users a variety of printing options. *Magus Systems Engineering, 33A Woodvale Green, Nepean, Ontario Canada K2G 4H3, (613) 225-5014; $24.95 US.*

Art Deli II, a five-disk collection of graphics that can be dumped to a printer through a graphics editor. Includes a booklet showing samples of all printouts. Categories on the five disks include: Kid Sports and Baby Animals; Birds & Ducks; Animated Favorites I & II; Boats & Cars; and Shapes & Road Signs. Each disk contains a viewing utility. *Specialty Projects, 4810 McCrory, Memphis, TN 38122, (901) 682-8737; $49.95 for the set, or $9.95 per disk, add $3 S/H.*

Ⓕ **Big BASIC**, a BASIC memory management program for the CoCo 3 that provides up to 472K of user programming and/or data storage in 512K CoCos or up to 92K in 128K CoCos. Unlimited size programs or data can be chained from disk without erasing variables or causing reinitialization. One large program or up to 58 small programs can run at once in multiple windows. *Danosoft, P.O Box 124, Station 'A', Mississauga, Ontario, Canada L5A 2Z7, (416) 897-0121; $39.95 U.S., $47.95 CDN, add $2.50 S/H.*

CoCo MIDI 3, a MIDI sequencer/recorder for CoCos 1, 2 and 3. Requires 64K, a disk drive, a Multi-Pak and a hardware MIDI interface (interface included). *Rulaford Research, P.O. Box 143, Imperial Beach, CA 92032, (619) 690-3648; $149.95.*

Ⓕ **Danosoft Disk Utilities**, a package of utility programs that alter the operating system without occupying user programming memory (uses memory formerly assigned to the cassette): *Big Disk* — for BASIC users, makes the computer consider both sides of a double-sided drive as one 80-track drive; *Double40* — lets BASIC recognize 40 tracks on each side of a double-sided drive; *Convert/Dsk* — formats an existing 35-track disk from the 36th to the 80th track without disturbing the contents of the first 35 tracks; and more. *Danosoft, P.O. Box 124, Station 'A', Mississauga, Ontario, Canada L5A 2Z7, (416) 897-0121; $17.95 U.S., $21.50 CDN, add $2.50 S/H.*

A Diamond in the Rough, a graphics Adventure (`PMODE 4`) in which the player becomes the assistant to J.R. Rudolph, master thief for hire, who has set his sights on the Tandy Diamond. Written in BASIC with ML subroutines, the game requires 32K and a disk drive. *JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, (805) 735-3889; $19.95 plus $3 S/H.*

Ⓕ **Diskedit**, a utility that allows users to restore deleted files, modify files on disk, rename files and make corrections to text files. *Reggie Kitchens, 1500 Link St., Apt. 53, Orange, TX 77630, (409) 882-0864; $9.95.*

FORTH09, an implementation of the Forth-83 system operating under OS-9 that assumes some familiarity with Forth. Includes an editor and assembler. Requires OS-9 Level I or II. *D.P. Johnson, 7655 SW Cedarcrest St., Portland, OR 97223, (503) 244-8152; 150 plus $3 S/H.*

KJV on Disk, #38, the books of I and II Timothy, Titus, Philemon and Hebrews from the King James version of the Bible, on disk in ASCII files for CoCos 1, 2 and 3. *BDS Software, P.O. Box 485, Glenview, IL 60025, (312) 998-1656; $3.*

The Lyra Companion, a book by Michael Stute, rock guitarist and MIDI user, that takes the reader through the process of using *Lyra*, from first bootup to advanced tips. Chapters include "Scales and Harmonization," "The Magic of MIDI" and "Compositional Techniques." *Rulaford Research, P.O. Box 143, Imperial Beach, CA 92032, (619) 690-3648; $9.95.*

Ⓕ **Memory Master**, a dual-window utility that lets users scan, edit, copy and print out memory from computer or disk. With the dual windows, it allows programs of unlimited size to be chained from disk without reinitializing or erasing variables. Written in BASIC with machine language subroutines. For 64K CoCos 1, 2 and 3. *Danosoft, P.O. Box 124, Station 'A', Mississauga, Ontario, Canada L5A 2Z7, (416) 897-0121; $24.95 U.S., $29.70 CDN, add $2.50 S/H.*

Milestones, a "road race" card game written for the CoCo 3. The goal is to travel 1000 miles along an imaginary road. *JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, (805) 735-3889; $19.95 plus $3 S/H.*

Presto Partner, a RAM-resident OS-9 organizer/reminder that "hides" in the background behind other applications and can be called up with a press of the CLEAR key. Users can then enter or read notes, determine ASCII values, be reminded of appointment dates previously entered, store Rolodex-type information on friends and contacts, and use a modem to automatically dial the phone. Requires a 512K CoCo 3, OS-9 Level II and at least one disk drive. *Alpha Software Technologies, P.O. Box 16522, Hattiesburg, MS 39402, (601) 266-2773; $29.95.*

Telepak II, an RS-232 pack for use with all models of the CoCo, "in any configuration, with no need for additional power supplies or extra cables." The pack features gold-plated edge connectors, data transmission rates up to 19,200 baud, and programmable word length, parity and number of stop bits. Plugs into cartridge connector or Multi-Pak. *Orion Technologies, P.O. Box 63196, Wichita, KS 67203, (316) 946-0440; $49.95.*

Ultra-Cat, a disk-cataloguing program for 64K CoCos that reads floppies and creates a seven-category *Ultra-Base* database file describing the contents of the disks. Separate files can be kept for each disk, or individual files can be merged into one large database. Requires *Ultra-Base*. *Tothian Software, Inc., Box 663, Rimersburg, PA 16248; $24.95 plus $2 S/H, $39.95 bundled with* Ultra-Base.

Ⓕ **Wheel of Fate**, a *Wheel of Fortune*-type game for the CoCo 3 that lets users create their own puzzle files; two puzzle files are included. *Robert Gatton, Rt. 1, Box 93, Olin, NC 28660, (704) 546-2423; $19.95.*

Window Writer, a menu/mouse-driven, point-and-click text editing/word processing program for use with the *Window Master* interface. Features WYSIWYG display with onscreen bold and italics, versatile formatting abilities and support for a variety of printers. Requires a 512K CoCo 3, a disk drive, a Hi-Res Joystick adapter and a mouse or joystick. RGB monitor recommended. A version for non-*Window Master* users is available ($79.95). *Cer-Comp, Ltd., 5566 Ricochet Ave., Las Vegas, NV 89110, (702) 452-0632; $59.95.*

A World at War, a machine language tactical wargame in which two armies battle it out in a battlefield 64 spaces square. The computer can control one, both or neither of the armies. Players can design terrain and customize such factors as firepower, range and strength of their armies. For the CoCo 3. *GSW Software, 8345 Glenwood, Overland Park, KS 66212, (913) 341-3411; $25.*

Ⓕ **First product received from this company**

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DOCTOR Q&A ASCII

By Richard E. Esposito
Rainbow Contributing Editor
with Richard W. Libra

Patch for *JEFF2*?

I have a disk utility program for my CoCo 1 called Jeff2. *It was written by Jeff Francis in 1984 and marketed by Spectrum Projects. I have since acquired a CoCo 3, and this program will not run on it. Since Spectrum apparently is no longer in business, I thought you might have a patch or modification that would allow it to run on the CoCo 3.*

T. J. Fraley
Freeport, Texas

All rights to Jeff Francis' *Disk Utility 2.1A* were sold by Spectrum Projects to Microcom Software. Contact Microcom at 1-800-654-5244 for an upgrade.

Trouble with CoCo 3

I have had my CoCo 3 for a little over a year now. It has 128K memory, a CCR-81 cassette recorder and television/composite monitor. I haven't had any trouble with it until now; when I turn my computer on, all I get is a blank, low-resolution green screen and a loud hum. There is no prompt message and pressing Reset doesn't help. I can't even get Larry, Moe and Curly to come up when I try a cold start. Could you please tell me what may be wrong and what, if anything, I need to replace? Also, do you know where I can get a grounding wrist strap or grounding cuffs?

Michael Antonucci
Stanton, California

Complete diagnostic information including oscilloscope and VOM readings can be found in the MS-260334 *Color Computer 3 Service Manual* ($15.60, orderable by your local Radio Shack store from Tandy National Parts). If you have no access to diagnostic equipment and are willing to gamble, a common failure is the CoCo's 68B09 microprocessor. A grounding strap can be purchased from any major electronics supply house.

Pascal Problems

I read the article in the March '89 RAINBOW *about the patches for OS-9 Pascal. I applied them and they work great! Many thanks.*

There are several other problems with the Pascal 2.0 compiler — the PCODE Translator (PascalT) and the Externals Linker (PascalE). I've tried these and get the same errors I formerly got from the compiler (Pascal). Is it possible to obtain patches for the rest of the compiler library so the whole thing can be used on Level II?

I also have a question concerning an error that I encountered while trying to run another Pascal 2.0 program. The error is a Pascal Error 244 (it isn't documented). What is it?

Phill Beistel
Pittsburgh

If anyone has additional patches for Pascal, please send them in and your name will be enshrined in this column. Error 244 is an OS-9 Read Error.

Invisible Errors

Recently, when typing in a RAINBOW *program and utilizing* RainbowCheckPlus, *I got a mismatch at the first checkpoint, indicating I had typed incorrectly. I made a check of the text on the monitor and found no error. To check more thoroughly, I ran off an* `LLIST`*ing but still found no error. I then retyped the section of the program and this time came up with matching numbers at the checkpoint, indicating no errors. I then ran off an* `LLIST`*ing of the second typing. Comparing the two* `LLIST`*s, I find them identical. Am I to assume that* RainbowCheckPlus *is not fool-proof, or is my 64K Ext. sick, or this is just one of those things known as a glitch?*

James S. McNeill, Jr.
Wilmington, Delaware

RainbowCheckPlus uses a checksum process. If you type in a program with missing or extra spaces, it will flag an error although syntactically correct. [See RAINBOW Info, Page 14 for more information.]

Keeping Up with Changes

I read THE RAINBOW *every month and am constantly attempting to enlarge my CoCo 3 setup. Since 1979 I have had a CoCo of some kind or another (even a 4K standard for $400). I have not been able to keep up with all the changes since I went to a CoCo 3. Every time I want to try out some software, I find it is not compatible or requires an uncommonly known patch. Could you please make a listing of compatible OS-9 Level I programs with any patches needed to get them to run in OS-9 Level II? I am most interested in OS-9 Level II with* Multi-Vue, DeskMate 3, *Pascal (written for Level I),* TS Word, TS Edit *and* TS Spell. *I am a capable assembly language programmer and know how to tear this machine apart, but I have no time to dig into the operating system. I would really like to buy C,* DynaCalc, *and several other programs written in Level I, but am afaid I will never be able to run them in Level II. I don't even know if the* TS Word/Edit/Spell *is really working properly. I am also looking for an OS-9 version of* COBOL. *Do you know if it exists? How about* FORTRAN?

Terry Steen
Hampton, Virginia

Richard Esposito is the principal engineer for BDM Corporation. He holds bachelor's, master's and doctorate degrees from Polytechnic Institute of Brooklyn. He has been writing about microcomputers since 1980.

Richard Libra is a simulator test operator for Singer Link Simulation Systems Division.

Most Level I software works fine with Level II. If it uses a Level I graphics screen, it can only run in a VDG window. Most games, spreadsheets, editors, etc. fit in this category. I know of no OS-9 COBOL compiler. Microware had a beta version of FORTRAN '77 a few years ago but it was never released.

Driver, Anyone?

I recently bought Max 10 *and* CoCo Max III *and own a ProWriter (C. ITOH) 8510A printer.* CoCo Max *doesn't support that printer to the best of my knowledge. The documentation mentions a "driver development kit." I wondered if anyone has already developed the driver for that printer and would be willing to share it.*

Howard F. Brock Jr.
Pittsburgh

If anyone has one, please let us know. Personally, I use a Tandy LP VIII for CoCo print work.

Unloadable *DeskMate*

A friend loaned me his copy of DeskMate, *which will not load in my CoCo I with 64K and Extended Color* BASIC. *I loaded the program in Appendix G and it still will not load. Maybe my DOS has something to do with it; I have two double-sided disk drives. The message on the screen at loadup is:*

```
DISK EXTENDED BASIC 1.0 COPYRIGHT
(C) 1983 BY ED HOSIER MODIFIED 40
TRACK FAST.
```

Can you help?

Dean B. Rice
Maryland

It could be due to the nonstandard Disk Color BASIC ROM in your machine. To find out for sure, borrow your friend's disk controller.

OS-9 Device Driver

Apart from mentioning that it exists, and how to Xmode it, there is virtually no documentation for an `/m1` *OS-9 device driver. How do I use it? Also, what exactly are* `MODPAK` *and* `ACIAPAK`*, which are frequently mentioned. (Both questions refer to OS-9 Level II.)*

Philip P. Brown
Fal, California

`/m1` is the device name for the Tandy Direct Connect Modem Pack (a.k.a. `MODPAK`). If a connection is established with another computer or terminal, you could type `echo hello>/m1`, which will display `hello` on the other machine. `ACIAPAK` refers to the discontinued Tandy Deluxe RS-232 Pak or the third-party clones now available.

Modem Fire-up

I have a Coco 3 with 128K and an old Multi-Pak with a different PAL chip. I still have trouble getting my modem to fire up. Any help would be appreciated. Also, do you know of a way to shut off the Reset button with software?

Robert Allen Dean
Flint, Michigan

Your modem problems could be rooted in the parameter settings in your communications program (proper baud rate, parity, number of bits, number of stop bits, etc.), the cable (printer cables are wired differently from modem cables), or a hardware problem in the modem or computer serial port itself. It is possible to intercept the Reset vector after the fact, but you cannot totally disable Reset with software since pushing that button causes a hardware operation.

For a quicker response, your questions may also be submitted through RAINBOW's CoCo SIG on Delphi. From the CoCo SIG> prompt, pick Rainbow Magazine Services, then, at the RAINBOW> prompt, type ASK for "Ask the Experts" to arrive at the EXPERTS> prompt, where you can select the "Doctor ASCII" online form which has complete instructions.

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A simpler way to call the SS.Tone system call

Syscall Sounds

By Darrel Behrmann

BASIC09 provides OS-9 Level II users with a way to unleash a great deal of the CoCo 3's power. In addition to most of the features available through Disk Extended Color BASIC (DECB), BASIC09 provides a number of other valuable features, including more looping commands, the ability to write programs using small modules, and a faster execution speed.

However, after experimenting with this powerful language for a while, I noticed that commands I had used often in DECB were missing. I needed a way to produce sounds other than the standard beep produced by the command `Run Gfx2("bell")`.

Eventually, I discovered that other sounds could be produced using the `Syscall` procedure to call the `SS.Tone` system call. (See Page 8-150 of the OS-9 Technical Reference.) This method seemed clumsy and confusing so I wrote the procedure `Sound` to simplify the process.

To use `Sound`, a calling program needs to provide values for the frequency, duration and amplitude of the tone to be produced. For example, to produce a low-pitched tone for two seconds at a medium volume, the calling program would contain the following line:

```
RUN SOUND(1500,120,30)
```

The program `TestSound` provides an example of using the `Sound` procedure from within a BASIC09 program.

`Sound` can also be used from the OS-9 command line after it is packed by typing:

`runb sound(`*frequency, duration, amplitude)*

substituting a number from 0 to 4095 for the frequency, from 0 to 255 for theduration, and from 0 to 63 for the amplitude.

The `Syscall` procedure must be in the current execution directory or in memory, and `Runb` must be available if `Sound` is to work properly from the OS-9 command line.

I hope this procedure makes it easier for you to write programs that are pleasing to the ears as well as the eyes.

(Questions or comments concerning this article may be addressed to the author at U-251 RD16, Rt.1, Napoleon, OH 43545. Please include an SASE when requesting a reply.) ❑

Darrel Behrmann has associate degrees in computer programming and accounting. He enjoys using his CoCo 3 as a hobby as well as for keeping records of his farm finances.

Listing 1: `Sound`

```
PROCEDURE Sound
 0000     (* This procedure will produce a sound
 0026     (* when given the frequency, duration,
 004C     (* and amplitude.
 005D     PARAM frequency,duration,amplitude:INTEGER
 006C     TYPE registers=cc,a,b,dp:BYTE; x,y,u:INTEGER
 0091     DIM regs:registers
 009A     DIM callcode:BYTE
 00A1     callcode=$8E
 00A9     regs.a=$01
 00B5     regs.b=$98
 00C1     regs.x=duration+256*amplitude
 00D5     regs.y=frequency
 00E1     RUN syscall(callcode,regs)
 00F0     END
```

Listing 2: `TestSound`

```
PROCEDURE TestSound
 0000     (* This program will test the Sound procedure
 002D     (*
 0030     DIM frequency,duration,amplitude:INTEGER
 003F     LOOP
 0041       RUN gfx2("clear")
 004E       PRINT "Enter the frequency you wish to hear in"
 0079       PRINT "the range of 0 to 4095.  Or enter -1 to"
 00A4       PRINT "quit."
 00AD       INPUT "Frequency: ",frequency
 00C0     EXITIF frequency<0 THEN
 00CC     ENDEXIT
 00D0       PRINT
 00D2       PRINT "Now enter the duration in the range of"
 00FC       PRINT "0 to 255."
 0109       INPUT "Range: ",duration
 0118       PRINT
 011A       PRINT "And finally enter the amplitude in the"
 0144       PRINT "range of 0 to 63."
 0159       INPUT "Amplitude: ",amplitude
 016C       RUN sound(frequency,duration,amplitude)
 0180     ENDLOOP
 0184     END
```

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Pyramix

This fascinating CoCo 3 game continues to be one of our best sellers. ***Pyramix*** is 100% machine language written exclusively to take advantage of all the power in your 128K CoCo 3. The Colors are brilliant, the graphics sharp, the action fast. Written by Jordan Tsvetkoff and a product of ColorVenture.

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A CLS Command for OS-9

By Mark E. Sunderlin

When I bought OS-9 for my CoCo, I looked forward to a world of new system power and was not disappointed. OS-9 reminds me so much of the UNIX system that I sometimes confuse the two.

It is a great improvement over Disk BASIC. Yet, I do miss one old friend: `Cls` (clears the text screen to one background color). Not having a `Cls` command encouraged me to flex my muscles and write my own.

It seemed simple enough — the manual said that pressing CTRL-L or typing `0C` (Hex) would clear the screen. I tried pressing CLEAR-L and then ENTER, but produced Error 216 ("Path Name Not Found"). Checking the manual, I found the `Echo` command, which "echoes" to the screen whatever I type in after it. For example, typing `echo hello` prints "hello" on the screen.

I tried typing `echo`, then pressing CLEAR-L and ENTER. The disk spun and about two seconds later the screen was blank. I could have left it at that, but the command was too slow and involved too much typing to make it convenient.

Enter the next step in the refinement of the command: a procedure file. This feature of OS-9 is made for storing a long set of commands in a batch file. It also gives you the ability to have any command, with your favorite options, called by whatever name you want. For example, if you want shorthand for a `Dir e` command, use `Build` to make a file called `De` containing one line: the `Dir e` command. Now when you type `de`, OS-9 reads the command(s) in your file `de` and executes them as if you had typed them directly from the keyboard.

To help me I made a procedure file called `Cls`:

```
OS9:build cls
? echo CLEAR L
? <CR>
OS9:
```

Now when I type in `cls` it is all done for me. This was closer to being what I wanted, but still slow. OS-9 had to read the `Cls` file, load the `Echo` command, and then execute. This took about two seconds. A major time lag was in the reading of the disks. I looked in the manual for a way to speed this up.

The `Load` command was what I was looking for. With it you can put a frequently used command in memory so it doesn't have to be called in from disk each time you want to use it. The `Link` command makes the command permanent in memory until you either re-boot the system or unlink the command.

The `Copy` command is a good candidate for this. When you are going to do a lot of file copies, it will make your life easier if `Copy` doesn't have to be loaded each time it is executed.

I loaded the `Echo` command into memory and linked it, then retried the `Cls` procedure file. It was much faster, taking about one second. But I didn't stop there, for two reasons: First, I wanted to make it even faster; and secondly, the `Echo` command took up too much memory space. So I decided to take the big plunge and write my own `Cls` command — in assembler.

Why assembler? C or BASIC09 would be so much easier and would take only about three lines of code each. One of my goals was to make `Cls` as small as possible so I could have it in core at all times without losing much memory. Both C and BASIC09 would produce larger code than assembler. Another reason was that I had just bought OS-9 and couldn't afford a high-level language yet.

Mark E. Sunderlin has a Bachelor's of Science in Mathematics and works for the U.S. Government as a systems analyst. He has been involved with computers since the TRS-80 Model I, and is a former Radio Shack employee.

Finally, here it is: my first OS-9 assembly program that clears the screen on the CoCo under OS-9 (see the listing). Let's look at the code a line at a time.

The first line is just a name command that generates no code and is basically a comment line. The next line tells the assembler to do the next set of code until it hits an `endc` on the first pass of the assembler. This is only one of the many conditions you can put on the `if`, letting you have greater control over the assembler as you can control `if`; it will assemble sections of code based on most any condition you want. This is a rather advanced topic and is covered in the OS-9 manuals.

The next line includes several already written OS-9 routines in your code so you can call them easily. We will use two of these routines later in the program. The `endc` tells the assembler to end the conditional assembly and resume normal assembly.

The next line is the `Mod` statement, which is required in every OS-9 assembly program, yet is often missed by beginners. Let's look at it a little closer. The `Mod` statement has six simple arguments. Their technical explanation is a bit difficult but not necessary in order to use them.

Notice how my `Mod` statement uses labels to equate certain points in the program to addresses needed in the `Mod` statement. The first is an equate to the last executable statement of the program; the second, a label to an address for the module name; the third, a constant in almost all OS-9 assembly programs, as is the fourth. The fifth is a label to the first executable statement in the program; and the sixth is a label to the end of the data area, which I'll explain in a minute.

The next two statements are constants for the OS-9 programs needed for `Mod` statements. You could put the `Prgrm+Objct` and `Reent+1` statements in the `Mod` statement itself, but these two constants make for a little more readable code.

The next statement sets aside one byte for storage. OS-9 keeps the program and its data area separate when it loads the program, keeping storage area separate from the executable part of the program. In our example we only need one byte of storage. If it needed more, we would add it here. Then we have an equate to mark the end of the data area as needed by the `Mod` statement above.

The next statement is the equate to the first executable statement of the program. The first executable line loads the address of the first byte of data area into the X register. OS-9 will always have the U register point to the data area when a program is entered. Thus the address of a label to a data area plus the U registers offset, is that label's effective address for the program.

Next Register A is loaded by pressing CTRL-L or by typing `0C` (Hex). This code clears the screen on the CoCo (but can be easily changed for other terminals by replacing `0c` with whatever your terminal needs to clear its screen).

The following statement stores the clear-screen character into the memory address called `Cntrl`. This also means that Register X points to the address of the clear-screen character.

Registers A and Y are each loaded with a one. The OS-9 call `I$Write`, a built-in routine defined in the `/d0/defs/os9defs`, does a write based on the contents of the A,Y and X registers. The A register is the Input/Output channel for the write-on. By default Channel 1 is the OS-9 standard out, which, unless you tell OS-9 otherwise, is your screen. Register Y tells `I$Write` how many bytes to write out and contains the address of the bytes to be written out. We have only one. Having set up all the registers, the call is made and the screen is cleared.

But we are not out of the program yet — OS-9 makes an orderly exit. It therefore gives the `F$Exit` command, which ends an OS-9 program and optionally displays an OS-9 error message. The error message number is stored in the B register before the call. Since there are no errors to look for, we clear Register B and call `F$Exit`. Our program is over and the screen is clear.

To use `Cls`, use either `Build`, `Edit` or your favorite editor and enter the source code as shown in the listing. You may safely leave out the comments. Then, after entering the text, assemble the program. The command line to do this is:

```
os9:asm cls o #12K
```

This produces a new command in the execution directory called `Cls`. To use the command, type `cls`. After the program loads, the screen clears. The beauty of this program is that it is only 39 bytes long. You can therefore load into memory permanently without making much difference in the size of other programs you are able to run. Do this by typing `load cls`. Now `Cls` is always in memory and runs almost instantly. You can even arrange `Cls` as automatically part of memory when you boot OS-9 — but that could be another article.

This is by no means the definitive `Cls` program. It has room for improvements such as size reduction and error checking. Perhaps you have some ideas.

(Questions concerning this article may be addressed to the author at 1430 Greystone Terrace, Winchester, VA 22601. Please include an SASE when requesting a reply.) ☐

The listing: `Cls`

```
*****************************
* CLS - AN OS9 PROGRAM      *
* TO CLEAR THE SCREEN       *
* WRITTEN BY:               *
*      MARK E. SUNDERLIN    *
*                           *
*****************************
         NAM  CLS
         IFP1
         USE  /D0/DEFS/OS9DEFS
         ENDC
         MOD  CLSSIZ,CLSNAM,TYPE,REVS,START,SIZE
CLSNAM   FCS  /CLS/
TYPE     SET  PRGRM+OBJCT
REVS     SET  REENT+1
CNTRL    RMB  1
SIZE     EQU  .
START    EQU  *
         LEAX CNTRL,U
         LDA  #$0C
         STA  CNTRL
         LDA  #$1
         LDY  #$1
         OS9  I$WRITE
         CLRB
         OS9  F$EXIT
         EMOD
CLSSIZ   EQU  *
         END
```

Barden's Buffer

16ECB

That's the Way the Ball Bounces

By William Barden, Jr.
Rainbow Contributing Editor

Here's a sample programming assignment for those just getting interested in programming their own games and graphics: Design a simple program that shows a ball dropped from the top center of the screen. It bounces in shorter heights until it comes to rest on the screen bottom. Sounds simple enough, doesn't it? The fact is, however, there are a number of ways to approach the problem.

First of all, assume that you are using Extended Color BASIC, not BASIC09 or another language. The problem can be done in BASIC09, C, Pascal or 6809 assembly language, but Extended Color BASIC keeps things simple and is most widely used.

This column gives a basic tutorial on approaches to take in animating graphics, including the pros and cons of different methods. You might want to pick up the Radio Shack book *Color Computer Graphics*, by William Barden, Jr. The book, although discontinued, is still available in many Radio Shack stores. A word of warning: The book was written before the days of CoCo Disk BASIC and OS-9. Some of the material could be supplemented, but almost all of it generally applies as a basic tutorial.

Method One: Using CIRCLE

The first method you might think of using is the `CIRCLE` command in BASIC. `CIRCLE` draws a circle anywhere on the screen — even off of it. We could draw a circle, leave it on the screen for a short period, erase it, then redraw it a little lower. If done fast enough, there is a simulation of a ball dropping or bouncing.

Listing 1 shows the basic scheme. First, set the screen mode. As you probably know, the CoCo has two or three types of screens, depending upon your model. The CoCo 1 and 2 have text and graphics screens, the text screen allowing a text display of 32 characters per row and 16 rows, or graphics in 256 pixels horizontally by 192 pixels vertically. The CoCo 3 has these modes, but also has a high-resolution graphics screen of 640-by-192 pixels. In the CoCo 1 and 2 you cannot intermix graphics and text unless you design your own text characters in graphics mode. In the CoCo 3, you can display graphics and text in Hi-Res mode. A general form for all models in a Lo-Res graphics screen is:

```
100 PMODE 3,1
110 PCLS
120 SCREEN 1,0
```

The first command sets the 128-by-192 four-color graphics mode with graphics Page 1. The next command clears the graphics screen, while the third command displays the graphics screen with a color set of `0`. `SCREEN` lets you flip back and forth between text and graphics screens. Extended Color BASIC comes back to text mode at the end of programs or to display error messages for those encountered during graphics operations. At this point you'll see a blank graphics screen. To draw a circle representing the ball, you need:

```
140 CIRCLE (128,96),20
160 GOTO 160
```

This command draws a circle at the center of the screen. The `128` refers to the *x* coordinate of the screen, `96` is the *y* coordinate. All low-res graphics modes use *x* values from zero to 255, left to right, and *y* values from zero to 191, top to bottom. So *x*=`128`; *y*=`96` centers the circle in the screen center. The `20` value is the radius of the circle, making the circle about as wide as 20/192 or one-ninth of the screen.

Ok, you've got the circle, but how do you move it? To simulate a bouncing ball, keep the circle centered from left to right and move it up and down. This means that the *x* value, the center of

---

Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years' experience in the industry covers a wide background: programming, systems analysis and managing projects for computers ranging from mainframes to micros.

the ball, can remain at `128`, but the *y* value changes. Since the circle is about 40 units in diameter, *y* can be changed from `0` to `172`. This scheme is shown in Figure 1.

The code for this is:

```
100 PMODE 3,1
110 PCLS
120 SCREEN 1,0
130 FOR Y=0 TO 170
140 CIRCLE (128,Y),20
150 NEXT Y
160 GOTO 160
```

If you run this program, you'll notice a strange result — the ball is drawn but not erased, resulting in a wide band down the center of the screen. The circle can be erased by several methods, one of which is clearing the screen with another `PCLS` after the `CIRCLE`. However, this isn't sufficient if you need to save other graphics on the screen. Another way is to use `CIRCLE` again, but with the background color specified:

```
145 CIRCLE (128,Y),20,1
```

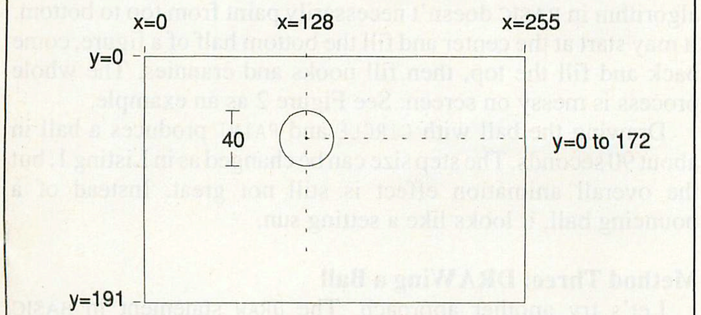

Figure 1: *x* and *y* Coordinates

The complete program is shown in Listing 1. If you run the program again, you'll see a rough-edged circle moving down the screen from top to bottom. The roughness is the result of the conversion of curved lines into a matrix of dots in 128-by-196 resolution. Also, another problem is that the ball moves very slowly, taking about 41 seconds to go from top to bottom! Can this be speeded up?

To speed up the movement of the ball, make the distance between draws of the ball greater than one pixel. The `FOR` statement draws a ball at 173 positions on the screen, from *y*=0 to *y*=`170`. Changing `FOR` to `130 FOR Y=0 TO 170 STEP 2` draws the ball at *y*=`0`, `2`, `4`, etc., about one-half the number of positions. This speeds up the movement by a factor of two. Even greater step sizes can be used, but if the distances become too great, movement looks choppy.

Method Two: CIRCLE with PAINT

The whole effect of using `CIRCLE` and drawing and redrawing the ball is not that terrific because the ball is just an outline. In Listing 2, I've added a `PAINT` statement to add color. `PAINT` starts from a given point and adds a color until a boundary is reached. Unfortunately, this takes a long time — every pixel within an area

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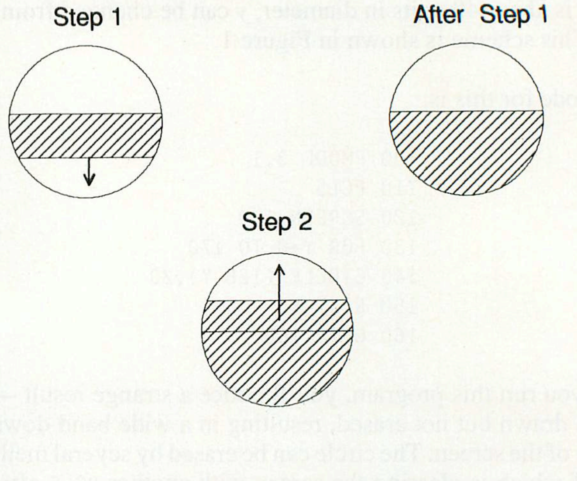

Figure 2: PAINT Fill Procedure

must be filled. `PAINT`ing the entire 256-by-192 screen, for example, takes about seven and one-half seconds — a long time by computer standards. `PAINT`ing the inside of the ball takes about a quarter of a second, slowing down the whole animation process even more than the skeleton ball drawn by `CIRCLE`. The `PAINT` algorithm in BASIC doesn't necessarily paint from top to bottom. It may start at the center and fill the bottom half of a figure, come back and fill the top, then fill nooks and crannies. The whole process is messy on screen. See Figure 2 as an example.

Drawing the ball with `CIRCLE` and `PAINT` produces a ball in about 90 seconds. The step size can be changed as in Listing 1, but the overall animation effect is still not great. Instead of a bouncing ball, it looks like a setting sun.

Method Three: DRAWing a Ball

Let's try another approach. The `DRAW` statement in BASIC allows you to draw a series of line segments on the screen. Some newer Microsoft implementations of `DRAW` allow you to draw a line between any two points, but in CoCo BASIC you can only draw horizontal, vertical or diagonal lines. However, we can simulate a circle by using `DRAW` subcommands.

```
150 DRAW "BM108,=Y;U10;E10;R10;F
10;D10;G10;L10;H10"
```

`DRAW` makes the circle-like figure shown in Figure 3. Subcommands are separated by semicolons (or blanks). The first subcommand, `BM108,=Y;` moves an imaginary graphics cursor to *x*=108, *y*, where *y* is the vertical position on the screen. (An equals sign indicates that the *Y* position is from a variable and not an absolute amount). Once the graphics cursor is positioned, the figure is drawn one line segment at a time. `DRAW` is like `CIRCLE` in that it draws a skeleton of a shape.

Unless a color is specified in the `DRAW`, the color of the lines drawn are in the foreground screen color. However, a color subcommand can be specified, and this is how the figure can be erased for animation. After the figure is drawn, the following line erases the figure by redrawing the same lines in screen background color:

```
160 DRAW "BM108,=Y;C1;U10;E10;R1
0;F10;D10;G10;L10;H10;C4"
```

The color is then set back to the foreground color for the next draw. When Listing 3 is run, the result is a flickering ball-like shape that floats from top to bottom in about 11 seconds, better than the two preceding methods, but still not effective graphics. The movement quickened after making the step size bigger, as in the preceding cases, but the method is still far from producing a bouncing ball effect.

Method Four: POKEing Along

In the days of the Tandy TRS-80 Model I (when programmmers had guts), a favorite method of speeding up screen graphics was a method called *screen pokes*. The `POKE` command in CoCo and other BASICs allow you to change any memory location from within a BASIC program. Since the CoCo graphics screen is really just a memory location, the poke can be used to change the screen as well. Depending upon your CoCo, the first page of graphics memory begins at &H600 (cassette system) or &HE00 (disk system). Try this simple disk BASIC program to get the idea:

```
100 PMODE 4,1
110 PCLS
120 SCREEN 1,0
130 POKE &HE00,255
140 GOTO 140
```

You should see a straight line chewed out of the upper left-hand corner of the screen. The `POKE &HE00,255` stored all ones (decimal 255 or binary 11111111) into memory location &HE00, which is the first byte of screen memory.

We should then get an animation effect by storing a figure by pokes at the proper screen memory locations, then erasing it a moment later, walking down the screen memory locations to move the figure from screen top to screen bottom in the program.

A program that does this is shown in Listing 4. It's made up of two basic sections — a series of pokes that draw the figure and another that erases the figure.

The figure is made up of eight rows and eight columns. Each of the eight columns are controlled by the eight bits of a byte in memory in `PMODE 4`, where each bit in memory controls the on/off status of a screen pixel. The bits are encoded in hexadecimal data. The hexadecimal data is a shorthand for binary as follows:

```
&H18=00011000    ...00...
&H3C=00111100    ..0000..
&H7E=01111110    .000000.
&HFF=11111111    00000000
&HFF=11111111    00000000
&H7E=01111110    .000000.
&H3C=00111100    ..0000..
&H18=00011000    ...00...
```

The address in memory, into which the byte needs to be poked, is given by the address of the graphics page start + 32, row + 16. Each row is made up of 32 bytes (256 bits), so the row addresses increment by &H20 (decimal 32) + &H10 (decimal 16) for the distance from the start of the row to screen center. This means (for a disk system) that the poke addresses are &HE10, &HE30, &HE50, etc. The *y* address added to this value moves the figure down the screen in steps of 32 (one row). The step size can be changed in increments of 32 to increase the speed. (The inner `FOR` loop adds some delay after the figure is drawn.)

The result of the poke method is a small ball that takes about 30 seconds to move from screen top to bottom, slower than the `DRAW` method, but faster than the `CIRCLE`/`PAINT` approach.

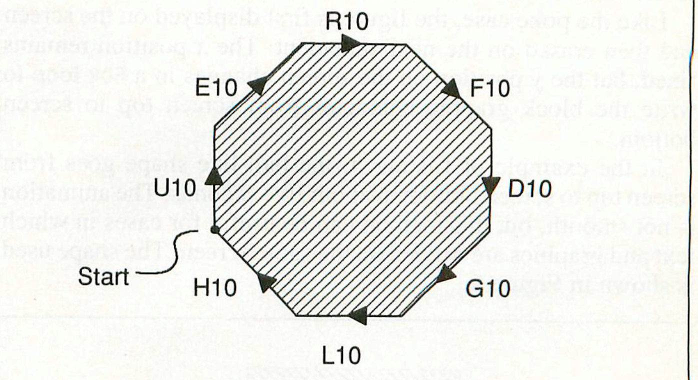

Figure 3: DRAW Figure

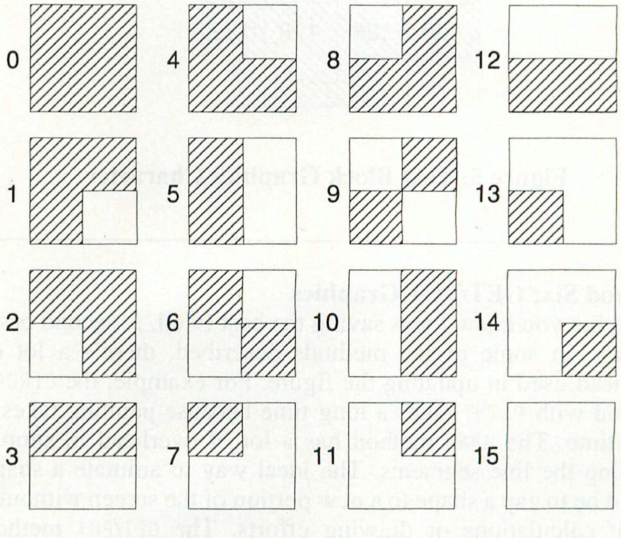

Figure 4: Text Mode Block Graphics

Method Five: Text Screen PRINT@

Another method uses graphics characters in text mode. The technique is somewhat similar to the one used in pokes, but instead of poking characters into memory, graphics characters are sent to a screen position.

The approach is shown in Listing 5. Block graphics characters are shown in Figure 4. They are all combinations of a four-element checkerboard, so, in effect, you get four separately programmable blocks per character position on the screen. The screen mode is the low-resolution text mode, which provides 32 characters per row and 16 rows per screen.

The character positions on the screen are calculated by multiplying the line number by 32 and adding the character position. The first screen row has positions 0, 1, 2, 3, . . . 15; the second screen row has positions 16, 17, 18, . . . 31; the last screen row has positions 480, 481, 482, . . . 511.

The block graphics character for each position is in the range of 128 through 255 and can be calculated by adding 128 *plus* a color code zero through seven times 16, plus a block graphics code of zero through 15 from Figure 4. As an example, for a zero color code,the block graphics codes are 128, 129, 130, . . . 143; for a one-color code, the codes are 144, 145, 146, . . . 159; for a *seven-color* code, the codes are 240, 241, 242, . . . 255.

Like the poke case, the figure is first displayed on the screen and then erased on the next statement. The *x* position remains fixed, but the *y* position on the screen changes in a `FOR` loop to write the block graphic character from screen top to screen bottom.

In the example of Listing 5, the ball-like shape goes from screen top to screen bottom in about five seconds. The animation is not smooth, but this method can be useful for cases in which text and graphics are needed on the same screen. The shape used is shown in Figure 5.

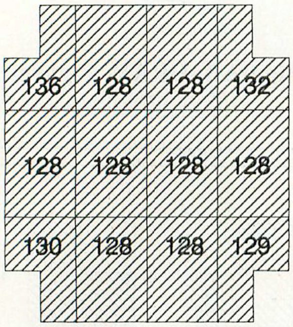

Figure 5: Text Block Graphics Character

Method Six: GET/PUT Graphics

I'll bet you knew I was saving the best (well. . . second best) for last. In some of the methods described, there's a lot of overhead used in updating the figure. For example, the `CIRCLE` method with `PAINT` takes a long time because painting takes a long time. The `DRAW` method has a lot of overhead in simply drawing the line segments. The ideal way to animate a shape would be to zap a shape to a new portion of the screen without a lot of calculations or drawing efforts. The `GET/PUT` method accomplishes this. The basic `GET/PUT` approach works like this: A figure is drawn somewhere on the screen, any shape or color. It is then saved in a storage area by a `GET` command. Later, `PUT` redraws the figure anywhere on the screen. The beauty of this approach is that the figure is saved as a memory image and written as a string of bytes without calculations, making it a very rapid screen update.

Listing 6 shows the basic approach. `PMODE 3` is set and the graphics screen is cleared and selected as before. A ball is then drawn in the center of the screen by `CIRCLE` and `PAINT`. A `170 GET (108,76)-(148,116),A` statement defines a block of the screen by specifying the upper left corner of *x*=`108`, *y*=`76` and a lower-right corner of *x*=`148`, *y*=`116`, as shown in Figure 6. The area defined should be large enough to include all of the figure you wish to save.

The A parameter in the `GET` statement indicates that the memory image for the block should be stored in Array A. Any array name can be used, but must be defined by a `DIM` statement beforehand. The `DIM` statement sets aside a block of memory for that area. The array, actually a dummy array used specifically for the `GET/PUT` operations, should be large enough to save all the bytes of the block defined on the screen. More than one array can be used.

When the `GET` is executed, memory data on the screen is stored in the array as pure binary data, ready to be written out by `PUT`. In the listing the screen is cleared once the image on the screen is saved — there's no longer any need to preserve it.

The data in the array saved by the `GET` can now be written out on the screen anywhere and as many times as is desired. This is done by a `PUT` statement such as `210 PUT (108,Y)-(108,Y+44),A`, which takes the data from dummy Array A and stores it on the screen at the upper left-hand and lower-right hand corners indicated in the `PUT`. In this case, *x* remains constant, but *y* varies according to a *y* loop to write the screen image from top to bottom.

If the `GET` image includes a buffer area of several blank rows on top and bottom, there is no need to erase the previous image. This is done automatically as the `PUT` overwrites the previous data, resulting in a nicely-formed, fully-colored ball that moves smoothly from top to bottom in under six seconds — still not a rapidly bouncing ball, but getting there!

Speeding Up the GET/PUT

Since the `GET/PUT` seems to be the best method of implementing the bouncing ball, let's see what else can be done to speed up the animation. An easy speedup is to increase the clock speed. This is not possible on the CoCo 1, is possible in some cases on the CoCo 2, and should work without problems on the CoCo 3. The trick on the CoCo 3 is to do a `POKE &HFFD9,255` to increase the clock speed, and a `POKE &HFFD8,255` to reset the clock speed back to normal. When this is done in the program of Listing 6, the ball travels from screen top to bottom in about 2.5 seconds, about twice the speed of the slow-speed clock.

Another thing that can be done is to compress the code by putting the `LOOP` statements for `PUT` into a single line. The fewer lines `BASIC` has to wade through to execute the loop, the faster it executes, although this is marginally effective in this case.

Another way to speed up execution is to make the step size a larger increment — something other than one. As long as the step size isn't too great, the smooth animation will still be preserved. Make certain when you do this, however, that there is enough of a buffer (blank lines at the top and bottom of the `GET` area) so that all previous parts of the figure are erased as the `PUT` is done. The program with these changes is shown in Listing 7. It moves the ball from screen top to screen bottom in about one second.

Bouncing the Ball

Up to this point we've only moved the ball from top to bottom — we haven't actually bounced it. Listing 8 shows one way to implement the bouncing. A separate subroutine is broken out to

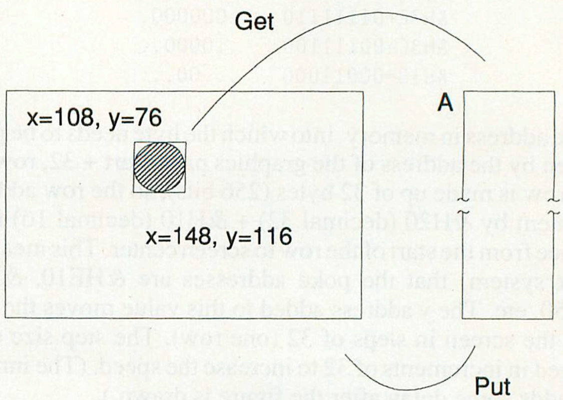

Figure 6: GET/PUT Screen Block

handle writing the blocks by `PUT`s from a given starting *y*, called `ST`, and a given ending *y*, called `EN`. When the ball is bouncing downwards, the starting *y* will be less than the ending *y*. When the ball is bouncing upwards, the starting *y* will be greater than the ending *y*. The subroutine handles both cases, stepping a positive or negative amount. Also, `SOUND` is added, which produces a beep every time the ball hits the bottom of the screen.

The first path for the ball to travel is easy — from the top of the screen (*y*=`0`) to the bottom (*y*=`152` to adjust for the height of the ball). The second path (the first bounce) is a little more difficult. First of all, the ball probably bounces only a portion of its original height due to air resistance and loss of energy. We'll assume that the ball bounces about 0.75 of its original height. For each bounce, therefore, we'll have to compute a new starting and ending path. The ending path on downward bounces is always *y*=`152`, the bottom of the screen. The starting point on downward bounces is the ending point of the last upward bounce — also easy. The starting point on upward bounces is the bottom of the screen. The ending point on upward bounces is 0.75 times the last distance traveled. This is shown by the code `220 IF EN=152 THEN EN=152-(EN-ST)*.75: ST=152 ELSE ST=EN: EN=152.`

The ball doesn't continue bouncing indefinitely. It's movements are quickly damped. The code `210 IF ABS(ST-EN)>1 THEN GOSUB 250 ELSE GOTO 210` detects when the next path is one unit, and stops the bouncing. The result is a good simulation of a bouncing ball — one that drops rapidly, bounces up about 3/4 of the last height, beeps when it hits the floor of the screen, and provides a satisfying ever-quickening series of beeps as the ball comes to rest.

A CoCo 3 Hi-Res Screen Version

Listing 9 shows the final version of the bouncing ball. This time it's implemented on a 640-by-192 four-color CoCo 3 screen. The high-resolution screen uses graphics commands preceded by an `H` that operates very similarly to low-resolution graphics commands — `HCLS`, `HCIRCLE`, and `HPAINT`. The `GET/PUT` in this case refers not to a `DIM`ensioned array, but to a buffer defined by `HBUFF`. The principle is the same.

A Faster Version?

There is one ultimate version of the bouncing ball — an assembly language version. Assembly language graphics are extremely fast, but very tedious to code. The `GET/PUT`, however, is fairly close to even assembly language speeds and is the most powerful way to implement all kinds of graphics in the CoCo 1, 2 and 3. Coupled with the Hi-Res screen of the CoCo 3 and text capabilities (`HPRINT`), you have an unbeatable combination. ❑

Listing 1: `BALL1`

```
90 ‘METHOD ONE-CIRCLE
100 PMODE 3,1
110 PCLS
120 SCREEN 1,0
130 FOR Y=0 TO 170
140 CIRCLE (128,Y),20
145 CIRCLE (128,Y),20,1
150 NEXT Y
160 GOTO 160
```

Listing 2: `BALL2`

```
100 ‘METHOD TWO-CIRCLE/PAINT
110 PMODE 3,1
120 PCLS
130 SCREEN 1,0
140 FOR Y=0 TO 170
150 CIRCLE (128,Y),20
160 PAINT (128,Y)
170 PAINT (128,Y),1
180 NEXT
190 GOTO 190
```

Listing 3: `BALL3`

```
100 ‘METHOD THREE-DRAW COMMAND
110 PMODE 3,1
120 PCLS
130 SCREEN 1,0
140 FOR Y=20 TO 170
150 DRAW “BM108,=Y;U10;E10;R10;F
10;D10;G10;L10;H10;”
160 DRAW “BM108,=Y;C1;U10;E10;R1
0;F10;D10;G10;L10;H10;C4"
170 NEXT
180 GOTO 180
```

Listing 4: `BALL4`

```
100 ‘METHOD FOUR-SCREEN POKES
110 PMODE 4,1
120 PCLS
130 SCREEN 1,0
140 FOR Y=0 TO 5824 STEP32
150 POKE &HE10+Y,&H18
160 POKE &HE30+Y,&H3C
170 POKE &HE50+Y,&H7E
180 POKE &HE70+Y,&HFF
190 POKE &HE90+Y,&HFF
200 POKE &HEB0+Y,&H7E
210 POKE &HED0+Y,&H3C
220 POKE &HEF0+Y,&H1B
230 FOR I=0 TO 30:NEXT
240 POKE &HE10+Y,0
250 POKE &HE30+Y,0
260 POKE &HE50+Y,0
270 POKE &HE70+Y,0
280 POKE &HE90+Y,0
290 POKE &HEB0+Y,0
300 POKE &HED0+Y,0
310 POKE &HEF0+Y,0
320 NEXT
330 GOTO330
```

Listing 5: BALL5

```
100 'METHOD FIVE-PRINT@
110 SCREEN0,1
120 CLS
130 FOR Y=0 TO 416 STEP32
140 PRINT@16+Y,CHR$(136);CHR$(12
8);CHR$(128);CHR$(132);
150 PRINT@48+Y,CHR$(128);CHR$(12
8);CHR$(128);CHR$(128);
160 PRINT@80+Y,CHR$(130);CHR$(12
8);CHR$(128);CHR$(129);
170 FOR I=1 TO 80:NEXT
180 PRINT@16+Y,CHR$(143);CHR$(14
3);CHR$(143);CHR$(143);
190 PRINT@40+Y,CHR$(143);CHR$(14
3);CHR$(143);CHR$(143);
200 PRINT@80+Y,CHR$(143);CHR$(14
3);CHR$(143);CHR$(143);
210 NEXT
220 GOTO220
```

Listing 6: BALL6

```
100 'METHOD SIX-GET/PUT
110 PMODE 3,1
120 PCLS
130 SCREEN 1,0
140 DIM A(100)
150 CIRCLE (128,96),20
160 PAINT (128,96)
170 GET (108,74)-(148,118),A
180 PCLS
190 FOR Y=0 TO 146
200 PUT (108,Y)-(148,Y+44),A
210 NEXT
220 GOTO220
```

Listing 7: BALL7

```
100 'METHOD SIX-IMPROVED SPEED
105 POKE &HFFD9,255
110 PMODE 3,1
120 PCLS
130 SCREEN 1,0
140 DIM A(100)
150 CIRCLE (128,96),20
160 PAINT (128,96)
170 GET (108,74)-(148,118),A
180 PCLS
190 FOR Y=0 TO 146 STEP 2:PUT (1
08,Y)-(148,Y+44),A:NEXT
220 GOTO220
```

Listing 8: BALL8

```
100 'METHOD SIX-BOUNCING
110 PMODE 3,1
120 PCLS
130 SCREEN 1,0
140 ST=0: EN=152
150 DIM A(100)
160 POKE &HFFD9,&HFF
170 CIRCLE (128,96),20
180 PAINT (128,96)
190 GET (108,74)-(148,118),A
200 PCLS
210 IF ABS(ST-EN)>1 THEN GOSUB 2
60 ELSE GOTO 210
220 IF EN=152 THEN EN=152-(EN-ST
)*.75: ST=152 ELSE ST=EN: EN=152
230 GOTO 210
240 POKE &HFFD8,&HFF
250 GOTO 250
260 IF ST>EN THEN GOTO 290
270 FOR Y=ST TO EN STEP 2: PUT (
108,Y)-(148,Y+44),A: NEXT
280 GOTO 310
290 FOR Y=ST TO EN STEP -2: PUT(
108,Y)-(148,Y+44),A:NEXT
300 GOTO 320
310 SOUND 100,1
320 RETURN
```

Listing 9: BALL9

```
100 'METHOD SIX-COCO 3 HIGH-RES
VERSION
110 HSCREEN 4
120 HCOLOR 3,1
130 HBUFF 1,1000
140 ST=0: EN=162
150 POKE &HFFD9,&HFF
160 HCIRCLE (320,96),20
170 HPAINT (320,96)
180 HGET (300,74)-(340,118),1
190 HCLS
200 IF ABS(ST-EN)>1 THEN GOSUB 2
50 ELSE GOTO 200
210 IF EN=162 THEN EN=162-(EN-ST
)*.75: ST=162 ELSE ST=EN: EN=162
220 GOTO 200
230 POKE &HFFD8,&HFF
240 GOTO 240
250 IF ST>EN THEN GOTO 280
260 FOR Y=ST TO EN STEP 4: HPUT
(300,Y)-(340,Y+44),1: NEXT
270 GOTO 300
280 FOR Y=ST TO EN STEP -4: HPUT
(300,Y)-(340,Y+44),1:NEXT
290 GOTO 310
300 SOUND 100,1
310 RETURN
```

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Adding Fireworks to *Find*

By Dale L. Puckett
Rainbow Contributing Editor

Last month I presented two handy utilities to help you find missing files on a hard disk. This month I'll introduce a program that lets you choose and run either of those utilities by clicking on your choice with the Color Computer's mouse. I'll also take a look at the beta version of Owlware's new *Window Writer* program and introduce a new icon editor that lives in the *Multi-Vue* shell presented last summer.

BASIC09 is a fine programming environment — Bill Brady proved it last year when he released *WizPro*. Now OwlWare has introduced *Window Writer*.

Robert Moody of Molalla, Oregon, sent a program that proves that any of us can sit down with BASIC09 and produce a tremendously friendly and professional application program. He sent a copy of *Maxic* — a mouse-driven icon editor that runs under *Multi-Vue*. I plan to publish the source code of *Maxic* in the August column.

Maxic Should be Named *Magic*

"I wrote *Maxic* last summer, but after school started I forgot about it," Moody said. "The program is simple and the best way to learn it is to sit down and use it."

I verified this statement soon after receiving the disk. That's the way programs should work. Intuitive programs sell. Programs requiring a 10-pound manual sit on the shelf and collect dust, because in today's busy world when you buy an application program to do a job, you don't have time to do the work the programmer should have done.

Moments after opening the envelope from Oregon, I copied *Maxic*'s `AIF` file to my `/dd/tools` directory, copied the icon Moody supplied to the `/dd/cmds/icons` directory, then put a copy of the program in BASIC09 I-code form in the execution directory, `/dd/cmds`. With these preliminary steps out of the way, I started *Multi-Vue* by running *Multistart* and opened the `/dd/tools` folder. Finally, I double-clicked on the *Maxic* icon and received a very pleasant surprise — the program is completely mouse driven and totally intuitive.

Initially, *Maxic* draws a 40-by-24 window on your Color Computer screen, filling the right-hand side of the window with a box used to hold a graphic listing showing 16 icons from the `/dd/cmds/icons` directory. If there are more than 16 icons in this directory, you can scroll through the remainder of the directory with the standard *Multi-Vue* scroll bar. To see the icons, go to the Dir Files menu and select "Load Dir" from the menu. The hourglass icon pops on the screen, and a few seconds later the icons appear. If you have another directory full of icons, you can look at them by using the `CHI` (Change Icon Directory) in the Dir Files menu.

After selecting an icon to edit, simply point to it and click twice. When you double click, the standard *Multi-Vue* arrow pointer goes away and an image of the icon itself appears in its place. Moving the mouse moves this image around the window; if the pointer is moved into the large edit window on the left side of the screen, the icon reads "open." A pointer moved over the icon near the top of the window changes the image of the icon to a "kill" sign. Clicking the pointer while the sign says "kill" deletes the icon. If you click while it says "open" it displays a large pixel-by-pixel image of the icon in *Maxic*'s edit window, and the pointer turns into a crosshair.

To change colors, simply move the mouse until the pointer is over the color box along the top of the screen and click. When at the color you want, move the mouse pointer back into the edit window and continue to edit the icon. To save work, move the mouse pointer back to the directory window on the right side of the screen. This directory window itself is fantastic — like having a visual catalog of all your icons.

Getting Better all the Time

Speaking of intuitive application programs, the official release of *Window Writer* should be available by the time you read this column. I received the final beta version from OwlWare in late March and it looks great. Tom Roginski said that people who bought the program in late March and April will receive a free upgrade sometime during May.

When *Window Writer* was introduced last winter, the crew at OwlWare said they hoped it would be similar to *Microsoft Word* and they came very close to their goal.

As a daily user of *Microsoft Word* I welcomed a similar program, especially one that runs under OS-9. This is the kind

---

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of application software needed if OS-9 is to survive. After evaluating the alpha version of *Window Writer* in January, I gave both OwlWare and program author Roger Dash a list of about 20 or 30 suggestions.

Upon receiving the beta version this month, I was pleased to notice that most of the issues raised had been addressed, making *Window Writer* extremely easy to install and use. Except for a few strange command names on the menu like "Execute formatter" instead of "Print", it was also very intuitive. I did, in fact, run it without opening the manual — the ultimate test!

Of course, if I had read the manual I would have noticed that a file named `epson_table` needs to be copied into a file named `esc_table` to match my printer to *Window Writer*. (Four printer table files are supplied with *Window Writer* — `ibm_table`, `epson_table`, `oki_table` and `tandy_table`.)

Window Writer brings you a powerful 80-column screen editor that lets you copy, delete or move words, lines or paragraphs. It also features a formatter that can handle complex printing, even though it's so easy to use that it makes simple jobs even simpler.

Characters affected by formatting codes are printed on the screen in different colors, underlined words appear underlined, and a few formatting codes remain invisible on the screen. This means that the width of a line on your Color Computer screen should always be the same as the width of the line on your printer.

A "print preview" window lets you look at how the document prints on the screen before sending it to the printer, showing where any headers or footers fall, where page breaks appear in the text, and any page numbers inserted by the program.

The pull-down windows make *Window Writer* easy to run, even for beginning computer users. But for those die-hards who believe that mice are for cats, you can use any available command from the keyboard. To do this, hold down either the CTRL or ALT key while striking another key. To make keyboard commands useful there must be some logical connection between the key you strike and the command you are executing. For example, "c" for copy, "p" for paste, "s" for save, etc. *Window Writer* needs a little fine-tuning here, especially in the File and Edit menus. I would like to see this program mimic *Microsoft Word*'s keyboard shortcut keys.

You can edit several files at the same time, edit one file while printing another, or perform several other tasks at the same time, thanks to OS-9 and its multitasking ability. If you get confused, help is only one keystroke or mouse movement away.

The beauty of a mouse-based editor blooms after you have entered all of the text and are ready to move things around. To move a piece of text, simply move the mouse pointer to the first character of the text and mark the position. Then move the mouse pointer, actually a square block cursor in a Color Computer OS-9 Level II text window, to the other end of the block of text and mark it. You then go to the menu and ask *Window Writer* to copy that block to its clipboard. The Copy command leaves the text in place in your file.

You can also cut the block of text from a file. The block marked is removed from the file but a copy is left on the clipboard until another Copy or Cut command is issued. When the block of text is on the clipboard, move the mouse pointer to the desired location and issue a Paste command. You can write a permanent copy of the clipboard, ala the Macintosh scrapbook, to a disk file at any time.

Needed to run *Window Writer* are two floppy disk drives, a 512K Color Computer 3 and an 80-column RGB or composite monitor. Of course you need a printer and a mouse to realize the full benefit of the program. Optionally, a Hi-Res joystick adapter — only $7.95 — and *Multi-Vue* make life easier. A hard drive or additional floppy drives are also welcome additions.

One interesting technique with *Window Writer* is running this from a RAM disk. OwlWare supplies the RAM Disk software with the program and tells you how to install it, which speeds up the operation of the program by an order of magnitude. I made out well here because I already have a Disto 512K RAM disk cartridge installed in my Color Computer 3 and can run *Window Writer* simultaneously with BASIC09 and several other lengthy Color Computer OS-9 applications programs in different windows at the same time.

Although performance is reduced, OwlWare says you can run *Window Writer* in a Color Computer 3 with 128K of memory, however, they don't recommend it. Since there is no memory in a 128K machine for a RAM disk, everything must be handled from the floppy disk drive, which slows things down considerably. You will also not be able to access the OS-9 Shell while the program is running.

Another example of intuitive command names that came up while exercising the beta version of the program centered around the justification mode. The user types 1, 2, 3 or 4 to choose the justification method wanted. I suggested answering instead with an L, C or R — for Left, Center or Right. I also encouraged OwlWare to use BASIC09's InKey system call to get this character, as well as any other one-keystroke response. If this change is made in the final released version, you'll have to type only one keystroke instead of two. And believe me they add up when you do a lot of writing.

There is also a nice point and click interface to use when opening text files. I suggested opening the parent and other directories from within this interface window, enabling the user to crawl up and down the menu trees from within *Window Writer* by means of the Macintosh Standard File Dialog Box. As it is, you must

OS9: SOFTWARE <D_P_Johnson >my_system >>no_errors #512K &

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use the Change Directory command from the pull-down File menu to move to a new directory on your hard disk.

It also would be handy to use a Backspace or Delete key function to back up across a line boundary. I use this feature frequently to combine paragraphs while running *Microsoft Word*. However, I am fully aware of the limitations of the Color Computer and realize that too much speed may be lost if using any other method.

Another improvement would be the ability to display a few key-invisible character codes on the screen, especially the carriage returns, line feeds, spaces and tabs. It makes an editing job much easier, and is essential if you are editing OS-9 Shell scripts or procedure files. I found this out when I edited a startup file with *Window Writer* and received an error message when an OS-9 command line in the procedure file had a space before the carriage return at the end of the line. Once removed with the delete character command, the procedure worked fine, but since I couldn't see these invisible characters, I didn't know the extra space was there.

It would also be a good idea to have the "yes or no" dialog boxes appear near the location of the mouse when they pop up. In fact, Yes or No buttons would be nice, with the ENTER key meaning Yes. Call me lazy, but once you compare *GShell+* to the original *GShell*, you'll be spoiled immediately.

After several weeks of use, it became evident that *Window Writer's* environment file `Env.file` would be better named as `Env.wwww`. This eliminates any conflicts with *Multi-Vue*'s environment file which uses the same name. While *Multi-Vue* can run from *Window Writer*'s `Env.file`, several color conflicts rendered programs run from *Multi-Vue* almost impossible to use. I patched the *Window Writer* module to change the name of `Env.file` to `Env.wwww` in my copy. Everything works great now and *Window Writer* coexists nicely with *Multi-Vue*.

During testing, I only discovered one fatal error. *Window Writer*, at least in the beta version, allowed me to quit the program without asking whether to save text first. It is essential that this oversight be fixed.

OS-9 Programmers: Pay Heed

When writing an application program for a multi-tasking or multi-user computer, you must remember that several other programs or people might be using the machine's resources at the same time. It also means, when exiting, you should leave things the way you found them. In other words, when you start the program, it should capture the screen and do its thing. However, when you click the "go away" box and the program disappears, the screen should look exactly the way it did before you started. Most of the time an altered screen is alright, but once in a while there is a screen display that you need to see again.

Along this same line, it is essential that any OS-9 program leave OS-9's `Tmode` parameters in its original form. This means that if the program turns line feed, pause and echo off when it starts up, it must turn them back on when it quits. A courteous OS-9 program will also remove its modules from memory when it quits, unless the user has loaded the modules ahead of time and permanently linked them into memory.

It is also important that *Window Writer* does not require you to use a special `Runb` file that contains several additional *Window Writer*-unique BASIC09 I-code modules merged with it. Many people merge `Gfx2` and `Gfx3` with `Runb` now and the technique is becoming standard. Because the extra modules cause *Window Writer*'s special `Runb` file to grow larger than 8K long, it causes conflicts with other programs that require all available memory.

WizPro, for example, uses an overlay technique that manages every byte of the 64K BASIC09 workspace while it is running. The extra 8K added to `Runb` by the *Window Writer* modules had me shaking my head the first time I tried to run *WizPro* after loading the `Runb` file.

Most of the things mentioned here are merely cosmetic improvements that make any program shine. Because of the fantastic improvements made between the alpha and beta versions of *Window Writer*, the final production version is certain to be a real winner.

OS-9 Information Available

Brian Wright wrote from Seattle, Washington to remind me about a familiar OS-9 resource often forgotton. He had just received a copy of *The OS-9 Source Book* from Microware in Des Moines, Iowa. While this book concentrates on OS-9 68K, its software section contains information about a number of products that run on a Color Computer 3 using OS-9 Level II. It also contains a complete description of all the software in the OS-9 Users Group Library. This alone makes it worth the price of a call to Des Moines.

Another OS-9 information source is *The OS-9 Catalog*, also available from Microware. While this book focuses on OS-9 68K, it gives an excellent overview

Listing 1: `Locate`

```
PROCEDURE Locate
 0000       (* Adding a window and menu bar to Find
 0027       (*
 002A       (* Window menu data structures
 0048      TYPE Mistr=_mnttl:STRING[15]; _mienbl:BYTE; _mires(5):BYTE
 0069       DIM MidScr:Mistr
 0072
 0073       (* The next structure holds the definition of a menu.
 00A8      TYPE mnstr=_mittl:STRING[15]; _mnid,_mnxsiz,_mnnits,_mnenabl
             :BYTE; _reser2,_mnitems:INTEGER
 00D4       DIM MNDscr:mnstr
 00DD
 00DE       (* The final structure defines the contents of an entire window.
 011E      TYPE wnstr=_wnttl:STRING[20]; _nmens,_wxmin,_wymin:BYTE; _wnsync
             :INTEGER; _wnrs(7):BYTE; _wnmen:INTEGER
 0153       DIM WndScr:wnstr
 015C
 015D       (* Now we set up our intercept code
 0180      TYPE IntCeptCod=StBCode:BYTE; IntAddr:INTEGER; RTICode,IntResult
             :BYTE
 019B       DIM IceptCode:IntCeptCod
 01A4
 01A5       IceptCode.StBCode:=$F7
 01B1      IceptCode.IntAddr:=ADDR(IceptCode)+4
 01C2       IceptCode.RTICode:=$3B
 01CE
 01CF       (* We must also define a data type to hold the 6809 registers
 020C      TYPE Registers=cc,a,b,dp:BYTE; x,y,u:INTEGER
 0231       DIM Regs:Registers
 023A
 023B       (* We must also tell our program what the mouse looks like.
 0276      TYPE rodent=valid,actv,totm:BYTE; rsrv0:INTEGER; ttto:BYTE; tsst
            :INTEGER; cbsa,cbsb,ccta,cctb,ttsa,ttsb,tlsa,tlsb:BYTE
            ; rsrv1,bdx,bdy:INTEGER; stat,res:BYTE; acx,acy,wrx,wry
             :INTEGER
 02E7       DIM msret:rodent
 02F0
 02F1       (* To enhance readability
 030A
 030B      DIM Menu_ID,Menu_Item:INTEGER
 0316      DIM DoMenuItem,IgnoreMenu,DoContent:BOOLEAN
 0325       DIM F_Icpt,F_Sleep:BYTE
 0330      DIM I_Getstt,SS_MnSel,I_Dup:BYTE
 033F     DIM I_SetStt,SS_MsSig,StdIn,StdOut,SS_GIP,SS_Mouse:BYTE
 035A      DIM thePath,MouseSig,Follow,HorPos:INTEGER
 036D       DIM Grp_Ptr,Ptr_Arr:BYTE
 0378       DIM oldpath(3),newpath:BYTE
 0388       DIM action:STRING
 038F
 0390     DoMenuItem:=FALSE \DoContent:=FALSE \IgnoreMenu:=FALSE
 03A2      Grp_Ptr:=202 \Ptr_Arr:=1 \F_Icpt:=$09
 03B8      F_Sleep:=$0A \I_Getstt:=$8D \I_SetStt:=$8E
 03D0      SS_MsSig:=$8A \SS_MnSel:=$87 \SS_GIP:=$94
 03E8      SS_Mouse:=$89 \Follow:=1 \StdIn:=0
 03FE      StdOut:=1 \MouseSig:=10
 040C       I_Dup:=$82
 0414
 0415       DIM EndStr:STRING[1]
 0421      DIM Null,CallCode,FunCode:BYTE
 0430       Null:=0
 0437       EndStr:=CHR$(Null)
 0440
 0441       (* Window type defs.
 0455     DIM WT_NBox,WT_FWin,WT_FSWin,WT_SBox,WT_DBox,WT_PBpox:INTEGER
 0470      WT_NBox:=0 \WT_FWin:=1 \WT_FSWin:=2
 0485      WT_SBox:=3 \WT_DBox:=4 \WT_PBox:=5
 049B
 049C      DIM MNEnbl,MNDsbl:BYTE
 04A7      MNEnbl:=1 \MNDsbl:=Null
 04B6
 04B7      DIM WINSync:INTEGER
 04BE      WINSync:=$C0C0
 04C6
 04C7     DIM MN_Move,MN_Clos,MN_Grow,MN_Uscrl,MN_Dscrl,MN_Rscrl,MN_Lscrl
            :BYTE
 04E6     DIM MN_Tndy,MN_File,MN_Edit,MN_Styl,MN_Font,MN_Char,MN_Find
            :BYTE
```

of OS-9, most of which directly applies to OS-9 on the Color Computer. This book describes the three configurations of OS-9 68K — Personal, Industrial and Professional — and an excellent description of how device drivers and device descriptors work. If you're planning to move up to OS-9 68K some day, this book is required reading. In the meantime, it's a good reference book for Color Computer OS-9 users.

Cgfx.l Error Discovered

David Breeding, of Russell Springs, Kentucky, has written with an important piece of information about the `Cgfx.l` library that comes with the developers package. Breeding says he has discovered errors with the `_ss_mgpb()` call. Listing 2 is a BASIC09 procedure you can run to correct those errors.

The first problem is the manual entry for this call. As the manual states the call does return a pointer to the buffer, however, two parameters were left out of the manual entry. The call also requires a two-byte value for action (0 to unmap the buffer, 1 to map it in) and a pointer to a two-byte storage space which holds the size of the buffer. The call should look like this:

```
char*_ss_mgpb(path,grpnum,bufnum,action,siz);
int path,grpnum,bufnum,action;
int *siz;
```

Within the library itself the call is set upto be "`_gs_mgpb()`" and calls for `I$GetStt` instead of `I$SetStt`. The code in Listing 2 renames the call to `_ss_mgpb()` and sets the call to `I$SetStt`. It also fixes the title to the module. Thanks David.

Anyone Have a Packet Radio BBS?

Larry George, KC1I, of 9 Eastview Drive, Sanford, Maine, is looking for an OS-9 Level II packet radio bulletin board. If you are a ham and know where he can find one, send a message to KC1I @ WB1DSW-1. Please send me a copy of the same message. My packet radio address is K0HYD @ N4QQ. You can also leave me a message on the WA3ZNW bulletin board.

Several amateur radio operators are also OS-9 enthusiasts and have been working on a bulletin board program and on a TCP-IP application. If you send me information about the status of your OS-9 packet radio projects I will act as a clearing house and pass them on to other amateur radio operators both on the air and via this column. Let's show the world what *OS-9* can do with real time communications!

Putting the Fireworks in *Find*

Last month we published two utility programs designed to help you find files you may have lost deep in the bowels of OS-9 hierarchial directories. It doesn't take long to forget where you stored a file, especially if you are working with a hard disk drive that contains thousands of files. *Find* helps you locate those files. *DiskDir* lets you make a listing of your hard disk — or any particular directory on the drive in a format that shows the hierarchial relationship of the directories and files.

Our programs last month were BASIC09 programs that were designed to be run from a standard OS-9 command line prompt. Their output can be redirected to a file on one of your disk drives or to a printer.

This month I set out to build an OS-9 window environment complete with pull-down menus, which you can use to exercise the two programs we presented last month. At the same time the window's menu bar gives you access to disk accessory programs under the Tandy hourglass menu.

This installment lets you run either *DiskDir* or *Find* from the menu by opening up a window, and operating like it did from the standard OS-9 command line. The next step, to be explained in the August issue, is actually rewriting *DiskDir* and *Find*, completely integrating them into the window environment. For example, I hope to create one box to accept your requests and another to hold the answers.

We also hope to add a third iteration of *DiskDir* which outputs the complete OS-9 pathlist to each file on a hard disk. If we do this, you will be able to import the file into a database program where you can sort it or perform other computer magic.

Back to our Shell

This month's effort is named *Locate*. To build it, I went back to the drawing boards and called in the code developed for the Multi-Vue Shell series last Fall. To save space I left only two of the menu selections under the Tandy Menu. This allowed deletion of other menu item definitions and the program code run by them. To call any of the standard Tandy desk accessories while using *Locate*, go back and pick up the *DoMenu* listing from the November 1988 issue of THE RAINBOW.

If you have already typed in this code, keep it. If not, you can pick it up by purchasing that edition of RAINBOW ON DISK, or download it from the RAINBOW section of the OS-9 On-Line forum on Delphi. I do everything to avoid typing this over and it enhances my productivity.

You'll need to use `Gfx3` from the August 1988 column to run *Locate*. If you

```
0505       MN_Move:=1 \MN_Clos:=2 \MN_Grow:=3 \MN_Uscrl:=4
0521       MN_Dscrl:=5 \MN_Rscrl:=6 \MN_Lscrl:=7
0536       MN_Tndy:=20 \MN_File:=21 \MN_Edit:=22
054B       MN_Styl:=23 \MN_Font:=24 \MN_Char:=8 \MN_Find:=40
0567
0568        (* Here are some more definitions you'll need in almost all of your
05AB        (* Basic09 / Multi-Vue application programs.  This group takes care
05EE        (* of the many buffers used within OS-9 Level II.
061F
0620       DIM Grp_Font,Grp_Clip,Grp_Pat2,Grp_Pat4,Grp_Pat6:BYTE
0637       DIM Fnt_S8x8,Fnt_S6x8,Fnt_G8x8:BYTE
0646       DIM Ptr_Pen,Ptr_Lch,Ptr_Slp,Ptr_Ill,Ptr_Txt,Ptr_Sch:BYTE
0661       DIM WR_Cntnt,WR_Cntrl,WR_OfWin:BYTE
0670       DIM Pat_Sld,Pat_Dot,Pat_Vrt,Pat_Hrz,Pat_Xhtc,Pat_Lsnt:BYTE
068B       DIM Pat_Rsnt,Pat_Sdot,Pat_Bdot:BYTE
069A
069B        (* First, the Buffer Numbers
06B7       Grp_Font:=200 \Grp_Clip:=201 \Grp_Ptr:=202
06CC       Grp_Pat2:=203 \Grp_Pat4:=204 \Grp_Pat6:=205
06E1
06E2        (* The Font Buffers
06F5       Fnt_S8x8:=1 \Fnt_S6x8:=2 \Fnt_G8x8:=3
070A
070B        (* The Mouse Pointer Buffers
0727       Ptr_Arr:=1 \Ptr_Pen:=2 \Ptr_Lch:=3 \Ptr_Slp:=4
0743       Ptr_Ill:=5 \Ptr_Txt:=6 \Ptr_Sch:=7
0758
0759        (* The Window regions for the Mouse
077C       WR_Cntnt:=0 \WR_Cntrl:=1 \WR_OfWin:=2
0791
0792        (* The Pattern Buffers
07A8       Pat_Sld:=0 \Pat_Dot:=1 \Pat_Vrt:=2 \Pat_Hrz:=3 \Pat_Xhtc:=4
07CB       Pat_Lsnt:=5 \Pat_Rsnt:=6 \Pat_Sdot:=7 \Pat_Bdot:=8
07E7
07E8       DIM _update,wxmin,wymin,timout,cur_wind,moussig,miscsig,wait
             :BYTE
080B       DIM sigcode,status,wpath:INTEGER
081A
081B       wxmin:=40 \(* minimum screen width for our window
0848       wymin:=24 \(* minimum screen height
0867
0868       _update:=3 \(* update rate for the mouse
088B       timout:=10 \(* timeout between clicks
08AB       Follow:=1 \(* update cursor when mouse moves, 0 for no follow.
08E5
08E6       cur_wind:=0 \(* flag to fork a process on current window
0918       moussig:=10 \(* signal code returned by the mouse when
0948       miscsig:=15 \(* miscellaneous signal code
096B       wait:=20 \(* signal code to wait for button to be pressed
09A1
09A2        (* After we define - or "type" - the special data structures
09E0        (* we need for a Multi-Vue based program, we must initialize
0A1C        (* the data in those structures.
0A3C
0A3D        DIM _tanitms(2):Mistr
0A4B       _tanitms(1)._mnttl:="Help"+EndStr \_tanitms(1)._mienbl:=MNEnbl
0A6E       _tanitms(2)._mnttl:="Shell"+EndStr \_tanitms(2)._mienbl:=MNEnbl
0A92
0A93        DIM _filitms(4):Mistr
0AA1       _filitms(1)._mnttl:="Open"+EndStr \_filitms(1)._mienbl:=MNDsbl
0AC4       _filitms(2)._mnttl:="Save"+EndStr \_filitms(2)._mienbl:=MNDsbl
0AE7       _filitms(3)._mnttl:="Print"+EndStr \_filitms(3)._mienbl:=MNDsbl
0B0B       _filitms(4)._mnttl:="Quit"+EndStr \_filitms(4)._mienbl:=MNEnbl
0B2E
0B2F        DIM _finditms(2):Mistr
0B3D       _finditms(1)._mnttl:="Find File"+EndStr \_finditms(1)._mienbl
             :=MNEnbl
0B65       _finditms(2)._mnttl:="List HDir"+EndStr \_finditms(2)._mienbl
             :=MNEnbl
0B8D
0B8E        (* Now we'll set up the entire menu
0BB1
0BB2        DIM Tndy_Mn:mnstr
0BBB       Tndy_Mn._mittl:="Tandy"+EndStr \Tndy_Mn._mnid:=MN_Tndy
0BDB       Tndy_Mn._mnxsiz:=10 \Tndy_Mn._mnnits:=2
0BF1       Tndy_Mn._mnenabl:=MNEnbl \Tndy_Mn._mnitems:=ADDR(_tanitms)
0C0B
0C0C        DIM File_Mn:mnstr
0C15       File_Mn._mittl:="Files"+EndStr \File_Mn._mnid:=MN_File
0C35       File_Mn._mnxsiz:=10 \File_Mn._mnnits:=4
```

```
0C4B      File_Mn._mnenabl:=MNEnbl \File_Mn._mnitems:=ADDR(_filitms)
0C65
0C66       DIM Find_Mn:mnstr
0C6F      Find_Mn._mittl:="Locate"+EndStr \Find_Mn._mnid:=MN_Find
0C90      Find_Mn._mnxsiz:=10 \Find_Mn._mnnits:=2
0CA6      Find_Mn._mnenabl:=MNEnbl \Find_Mn._mnitems:=ADDR(_finditms)

0CC0
0CC1       (* Now that we have defined the items in the menu and the menu itself,
0D07       (* we can define the window that we want the menu to appear in.
0D46
0D47       DIM Menus(3):mnstr
0D55
0D56      Menus(1):=Tndy_Mn \Menus(2):=File_Mn \Menus(3):=Find_Mn
0D77
0D78      WndScr._wnttl:="Locate from Rainbow"+EndStr \WndScr._nmens:=3
0DA5      WndScr._wxmin:=80 \WndScr._wymin:=24
0DBB
0DBC       (* _wnres, an array of seven reserved bytes, sits here
0DF2      WndScr._wnsync:=WINSync \WndScr._wnmen:=ADDR(Menus)
0E0C
0E0D       (* Let's create a window
0E25
0E26       RUN Gfx2(StdOut,"CurOff")
0E39      RUN gfx3(StdOut,"ss.wnset",ADDR(WndScr),WT_FSWin)
0E59      RUN gfx3(StdIn,"ss.gip",$0101,$FFFF)
0E74      RUN gfx3(StdIn,"ss.mous",$0301,Follow)
0E91
0E92      (* Now we can the call to set up the intercept.
0EC1
0EC2      CallCode:=F_Icpt
0ECA      Regs.x:=ADDR(IceptCode)
0ED8      Regs.u:=ADDR(IceptCode)+4
0EE9      RUN SysCall(CallCode,Regs)
0EF8
0EF9      RUN Gfx2("gcset",Grp_Ptr,Ptr_Arr)
0F10
0F11      (* The main loop of our program starts here
0F3C
0F3D      LOOP  \(* Do this forever
0F51
0F52
0F53        IceptCode.IntResult:=0 \(* Initialize Signal Report
0F79        RUN gfx3(StdIn,"ss.msig",MouseSig)
0F92
0F93        (* Now we must tell the process to go to sleep until
0FC7        (* it receives a signal to wake up.
0FEA
0FEB        CallCode:=F_Sleep
0FF3        Regs.x:=0 \(* Sleep forever - at least till signal
1026        RUN SysCall(CallCode,Regs)
1035
1036      EXITIF IceptCode.IntResult=2 THEN  \(* Escape with BREAK key
105D      ENDEXIT
1061
1062        IF IceptCode.IntResult=MouseSig THEN
1072          RUN gfx3(StdIn,"gs.mous",ADDR(msret)) \(* Go Read Mouse
109C          IF msret.stat=WR_Cntrl AND msret.cbsa<>0 THEN
10B6            DoMenuItem:=TRUE
10BC          ELSE
10C0            DoMenuItem:=FALSE
10C6          ENDIF
10C8        ENDIF
10CA
10CB        IF DoMenuItem=TRUE THEN
10D6          RUN gfx3(StdIn,"ss.mnsel",Menu_ID,Menu_Item)
10F5
10F6          IF Menu_ID<>0 THEN
1102            GOSUB 1000 \(* Go handle menus
1118          ENDIF
111A        ENDIF
111C
111D      ENDLOOP
1121
1122      (* Your Program code that deals with events
114D      (* in the content region of the window goes here.
117E
117F      END
1181
1182 1000 IF Menu_ID=MN_Clos OR Menu_ID=MN_File AND Menu_Item=4 THEN
11A1        action:="Alert"
```

prefer not to use `Gfx3`, insert the complete Syscall code in place of every `Gfx3` call. `Gfx3` makes the job much easier and I recommend using it for all BASIC09 programming in a windowing environment. It also can be found in the August issue of RAINBOW ON DISK or in the RAINBOW section of the OS-9 On-Line forum data libraries.

Locate also calls *DoAlert*, which was published along with *DoMenu* in November 1988. You can use the same copy or delete the calls to *DoAlert* and do without the fancy push buttons. In place of:

```
run
gfx3(StdOut,"sswnset",
addr(WindScr),WT.FSWin)
```

you can substitute:

```
callcode:=I_SetStt
Regs.a:=path
Regs.b:=ss_sbar
Regs.x:=horizpos
Regs.y:=vertpos
run syscall(CallCode,Regs)
```

I prefer the `Gfx3` approach.

The Tandy Menu within *Locate* in this month's code lets you run the OS-9 Help utility, and lets you start a Shell and run another OS-9 application from within *Locate*. Let's look now how we turned *DoMenu* into *Locate*.

If you can, dig into your files, pull out the November issue and directly compare the two listings. This helps you learn how to convert *DoMenu* into your own menu-driven application program.

The first changes appear in the definition of the arrays that hold the various menu items. For example, `_tanitms(9)` becomes `_tanitms(2)`. Likewise, `filitms(6)` becomes `_filitms(4)`. `_editms(6)` disappears altogether and is replaced by `finditems(2)`.

Then you must change the value of the `_mnnits` field in each of the menus. For example, `Tndy_Mn._mnnits:=9` becomes `Tndy_Mn._mnnits:=2`, etc.

You'll then notice that the command `Edit_Mn._mittl:="Edit"+EndStr` becomes `Find_Mn._mittl:="Locate"+EndStr`. We changed the window title to `"Locate"` from `"Rainbow"`.

After these menu changes we removed the subroutines we wouldn't be using any more and rewrote the code that uses the value of `Menu_ID` to drive an `"ON Menu_ID GOSUB 1110, 1120"` routine. Again the easiest way to convert a program is to compare the two listings.

That about wraps it up for July. Enjoy *Locate* and keep on hacking! ☐

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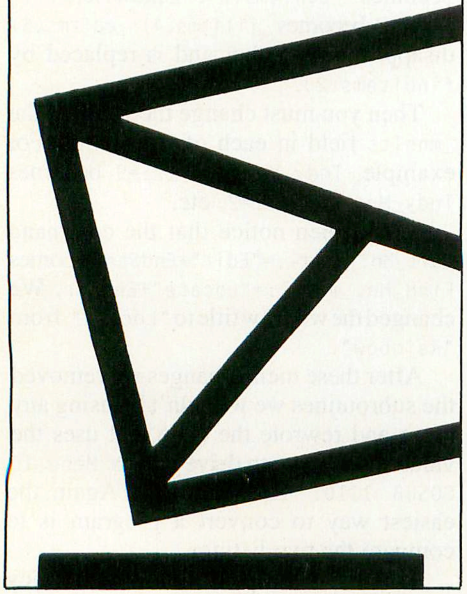

```
11AD        RUN DoAlert(action,"Quit Demo? ","Yes     ","","No     ",ADDR
              (WndScr))
11E1        IF LEFT$(action,3)="Yes" THEN
11F3          SHELL "display c"
1200          PRINT "Thank you for using Locate from DaleSoft and The Rainbow"
123C          GOTO 9999
1240        ENDIF
1242      ELSE
1246        IF Menu_ID=MN_Tndy THEN
1253          RUN Gfx2("gcset",Grp_Ptr,Ptr_Arr)
126A          RUN Gfx2("curoff")
1278          ON Menu_Item GOSUB 1110,1120
1287        ELSE
128B          IF Menu_ID=MN_Find THEN
1298            RUN Gfx2("gcset",Grp_Ptr,Ptr_Arr)
12AF            RUN Gfx2("CurOff")
12BD            ON Menu_Item GOSUB 5010,5020
12CC          ENDIF
12CE        ENDIF
12D0      ENDIF
12D2      RETURN
12D4
12D5 1110 (* Help
12DF      RUN Gfx2("OWSet",1,1,6,72,12,0,1) \REM Create Overlay Window to display
help file
132E      SHELL "help"
1336      RUN Gfx2("OWEnd")
1343      RUN Gfx2("GCSet",Grp_Ptr,Ptr_Arr)
135A      RETURN
135C
135D 1120 (* Shell
1368      RUN Gfx2("GCSet",0,0) \(* Turn graphic cursor off
1395      RUN Gfx2("OWSet",1,1,8,72,12,0,1) \(* Create Overlay Window
13CF      RUN Gfx2("CurOff")
13DD      RUN gfx3(StdOut,"ss.wnset",ADDR(WndScr),WT_DBox) \(* Make Window
140B      RUN Gfx2("CurOn")
1418      RUN Gfx2("Color",0)
1428      SHELL ""
142C      RUN Gfx2("OWEnd")
1439      RUN Gfx2("GCSet",Grp_Ptr,Ptr_Arr)
1450      RETURN
1452
1453
1454 2000 (* Dress up the opening box
1472      RUN Gfx2("Logic","XOR")
1485      RUN Gfx2("Color",1)
1495      HorPos:=10
149C      REPEAT
149E        RUN Gfx2("Box",320-HorPos,96-HorPos/4,320+HorPos,96+HorPos
              /4)
14CD        RUN Gfx2("Box",320-HorPos,96-HorPos/4,320+HorPos,96+HorPos
              /4)
14FC        HorPos:=HorPos*1.3
150D      UNTIL HorPos>300
1519      RUN Gfx2("Logic","OFF")
152C      RUN Gfx2("Color",0)
153C      RETURN
153E
153F 3000 (* Close the Box
1552      RUN Gfx2("Logic","XOR")
1565      RUN Gfx2("Color",1)
1575      HorPos:=300
157D      REPEAT
157F        RUN Gfx2("Box",320-HorPos,96-HorPos/4,320+HorPos,96+HorPos
              /4)
15AE        RUN Gfx2("Box",320-HorPos,96-HorPos/4,320+HorPos,96+HorPos
              /4)
15DD        HorPos:=HorPos/1.5
15EE      UNTIL HorPos<10
15F9      RUN Gfx2("Logic","Off")
160C      RUN Gfx2("Color",0)
161C      RUN Gfx2("OWEnd")
1629      RETURN
162B
162C 4000 (* Make Overlay Window for Tandy Desk Acessories
165F      RUN Gfx2("OWSet",1,1,6,74,14,0,1)
1681      GOSUB 2000 \(* Make the open flashy
169C      RUN Gfx2("Box",0,0,639,191)
16B4      RUN Gfx2("CurXY",1,2)
16C7      PRINT "Please wait ... "
```

```
16DB       RETURN
16DD
16DE 5010 (* Run Find Utility
16F5       RUN Gfx2("GCSet",0,0) \REM Turn off cursor first
1720       RUN Gfx2("OWSet",1,1,4,74,14,0,1) \REM Create overlay window
175A       RUN Gfx2("CurOff")
1768      RUN gfx3(StdOut,"ss.wnset",ADDR(WndScr),WT_DBox)
1788       RUN Gfx2("CurOn")
1795       RUN Gfx2("Color",0)
17A5       SHELL "find"
17AD       RUN Gfx2("OWEnd")
17BA       RUN Gfx2("GCSet",Grp_Ptr,Ptr_Arr)
17D1       RETURN
17D3
17D4 5020 (* Run DoDir to list Hierarchial Directory
1801       GOSUB 4000 \REM Go open overlay window
181E       SHELL "diskdir"
1829       GOSUB 3000 \REM Close overlay window
1844       RETURN
1846
1847 9999 (* Always turn off graphics cursor before leaving program
1883       RUN Gfx2("gcset",0,0)
1896       END
1898
1899
```

Listing 2: Fixgfx

```
PROCEDURE fixcgfx
 0000      (* Patch for cgfx.l _ss_mgpb library call
 0029      (* changes call in routine from GetStt to SetStt.
 005A      (* changes call from _gs_mgpb to _ss_mgpb
 0083
 0084      DIM path:BYTE; char,putchar:STRING[1]
 009A      DIM place:INTEGER
 00A1      DIM str:STRING; srchchr:STRING[1]
 00B3
 00B4      OPEN #path,"cgfx.l":UPDATE
 00C5
 00C6      (* Fix title to sbrtn
 00DB      place:=$0489
 00E3      str:="gsmgpb_a"
 00F2      srchchr:="g"
 00FA      putchar:="s"
 0102      GOSUB 500
 0106
 0107      (* Fix label for entry - changes call to _ss_mgpb from _gs_mgpb
 0147      place:=$0495
 014F      str:="_gs_mgpb"
 015E      GOSUB 500
 0162
 0163      (* Change system call from I$GetStt" to I$SetStt
 0193      place:=$04D4
 019B      str:="GetStt"
 01A8      srchchr:="G"
 01B0      putchar:="S"
 01B8      GOSUB 500
 01BC      CLOSE #path
 01C2      PRINT
 01C4      END "file patched ..."
 01D8
 01D9 500  SEEK #path,place
 01E6      GET #path,char
 01F0      IF char<>srchchr THEN
 01FD        CLOSE #path
 0203        END "Not at "; str; " pos ..."
 021D      ENDIF
 021F      SEEK #path,place
 0229      char:="S"
 0231      PUT #path,putchar
 023B      RETURN
 023D
```

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An index to the articles, programs, reviews and authors appearing in THE RAINBOW from July 1988 through June 1989.

Compiled and Edited
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TOTAL NUMBER OF ARTICLES
(July 1981 - June 1989) - 4657

This is the sixth index to THE RAINBOW.

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Leslie A. Foster is the System Manager of Novanet, a jointly-owned computer library system for the academic libraries in Halifax, Nova Scotia.

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Hutchison, Don. "The computer connection." *(November 1988)* 28 — Connecting a CoCo to other computers.

Hyre, Leonard. "Election '88." *(November 1988)* 58 — Keep track of election results. ELECTION

Hyre, Leonard. "Convention." *(July 1988)* 110 — Help keep track of voting at conventions. CONVENTN

Jenkins, Dave. "An RGB demonstration." *(January 1989)* 65 RGBDEMO

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Johnson, Richard K. "More than a house." *(February 1989)* 110 — Help organize search for the right home. DRIVEBY; HOUSE; LOANDATA

Johnson, Richard. "Stalking the used car." *(September 1988)* 16 — Used car shopping guide. USEDCARS

Johnson, Samuel D. "EduSpell." *(December 1988)* 42 — First in a series developing a talking, spelling tutor. SPELLER; ROMRAM; SETHELP; TAKETEST

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Kenny, Keiran. "For the birds." *(April 1989)* 83 — Graphics demo BIRDSEED

Kenny, Keiran. "Guess who." *(July 1988)* 83 GUESSWHO

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Kenny, Keiran. "Who ya gonna write?" *(April 1989)* 80 — Print mailing labels. EZLABELS

Kenny, Keiran. "The building blocks of graphics." *(February 1989)* — Introduce lo-res graphics. CLRBLOKS

Kenny, Keiran. "The flip side." *(January 1989)* 22 — Use one sheet paper to print a 6 page pamphlet. BOOKLET

Kiedaisch, Charles A. "One liner contest winner." *(September 1988)* 120 — Convert fractions to decimals.

Klein, Joel F. "It's your move." *(August 1988)* 28 — Chess simulation. CHESS

Knapik, Steve. "Hacker, beware." *(December 1988)* 91 — Disk file protection. LOCKOUT

Kolar, Joseph. "BASIC training: BASIC bird watching." *(May 1989)* 88 — Creating figure of bird. FLIGHTS1-3

Kolar, Joseph. "BASIC training: Boxcars, boxcars, boxcars." *(June 1989)* 80 BOXCAR1

Kolar, Joseph. "BASIC training: Count your eggs before they drop." *(April 1989)* 64 BIGBIRD

Kolar, Joseph. "BASIC training: Creating a utility screen worksheet." *(September 1988)* 80 — Tutorial for DRAW command.

Kolar, Joseph. "BASIC training: Let's GET going." *(January 1989)* 74

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Kolar, Joseph. "BASIC training: The Encyclopedia CoColoria." *(August 1988)* 82 — Discusses back issues of Rainbow.

Kolar, Joseph. "BASIC training: Thirty days hath September." *(July 1988)* 86 — Tutorial to teach students the months of the year. 12MONTHS

Kolar, Joseph. "BASIC training: What's the angle?" *(November 1988)* 84 — Graphics tutorial.

Kolesar, Fred. "EZrun." *(June 1989)* 62 — Autorun BASIC programs by typing in their filenames. EZRUN

Kyllo, Donald. "Cryptologist's sidekick." *(July 1988)* 80 CRYPTAID

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McKernan, Chris. "Escape from Tut's tomb." *(July 1988)* 58 — Arcade game written in machine language. ONE; TWO; THREE; FOUR

Messer, Shane. "Hi-res screen dump." *(May 1989)* 74 DUMP132

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Miller, Stephen. "Has anyone seen my string?" *(March 1989)* 80 ASCSERCH

Miller, Stephen. "ML-Data." *(August 1988)* 100 — Routine to convert machine language program into BASIC. ML-DATA

Mims, Eric Ryan. "Just one touch—just one breath." *(February 1989)* 50 — CoCo makes calculations easier for the disabled. CALCLATR

Mitchel, Barry J. "All the right moves." *(December 1988)* 116 — Correction, April 1989, p.48. — Faster graphics. SCRLDEMO; FASTSCRL

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Mony, Sam. "Two-liner contest winner." *(March 1989)* 148 — Printer utility.

Moore, Clayton R. "Asteroid dodge." *(June 1989)* 90 ASTEROID

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Moos, Patricia. "Fright night." *(October 1988)* 86 — Pumpkin graphic. SPOOK

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Murray, Ken. "A CoCo Christmas." *(December 1988)* 95 — Chrismas poem.

Musumeci, John. "Now or never." *(January 1989)* 58 — Music and graphics demo. MANDO

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Perlman, Richard. "The do-it-yourself database: Subroutines and program code. *(February 1989)* 36 — First in a series of tutorials SUBDEMO; REALMENU; MARBLE1; MARBLE2

Phillips, Charles F. "CoCo 3 green screen blues." *(July 1988)* 83 — CoCo 3 output to monochrome monitor. MONO3

Phillips, John E. "The mathematics of chaos." *(March 1989)* 81 FRACTAL

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Roseman, Mark. "A new outlook for OS-9." *(July 1988)* 16 — Using subdirectories and shell scripts to build an OS-9 menu system.

Rowan, Don. "One liner contest winner." *(July 1988)* 131 — Converts PRINT to SET or vice versa.

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Scerbo, Fred B. "Wishing Well: Matching opposites." *(August 1988)* 92 — Basic vocabulary for elementary students. OPOSITE1

Scerbo, Fred B. "Wishing well: CoCo uses some comma sense!" *(July 1988)* 156 — Training on correct comma usage. COMMAS

Scerbo, Fred B. "Wishing well: Count on CoCo." *(February 1989)* 82 — Program designed to teach fundamental math skills to new students. COUNTME

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Scerbo, Fred B. "Wishing well: Growing up with CoCo." *(November 1988)* 146 — Building on skills developed in earlier games. PICTURES

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Spiller, Jeremy. "What disk drive?" *(December 1988)* 100 — Get more memory without disconnecting the disk drive on CoCo3 . DISKOFF3

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Toepke, Michael. "Two liner contest winner." *(August 1988)* 81 — Pong type game.

Toepke, Michael. "Two liner contest winner." *(December 1988)* 120 — Mastermind type game.

Toepke, Michael. "Two liner contest winner." *(March 1989)* 152 — Game.

Turner, David. "Bills, bills, bills!" *(October 1988)* 14 — Program to help roommates organize expenses. ROOMMATE

Turner, Del. "Hint." *(August 1988)* 169 — Use of COBBLER command.

Turner, Del. "Hint." *(July 1988)* 189 — 'Handy work window.'

Turner, Del. "Hint." *(November 1988)* 92 — Discussion of memory and OS9.

Turner, Del. "Hint." *(October 1988)* 83 — Three handy screens.

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DOODLER3 Bernico, Bill. "Doodle ditty." *(January 1989)* 60

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DRIVEBY; HOUSE; LOANDATA Johnson, Richard K. "More than a house." *(February 1989)* 110 — Help organize search for the right home.

DRIVERLT; DRIVERLE etc. Curtis H. Allen. "High capacity screen dumps for the shoestring desktop publisher part 1." *(May 1989)* 100 — Correction, June 1989, p. 66.

DUMP132 Messer, Shane. "Hi-res screen dump." *(May 1989)* 74

DUMPBAS; DUMPBIN Nee, William P. "Machine language made BASIC part 3: What a dump!" *(September 1988)* 98

EAGLE Caldwell, Steve. "Here eagles dare." *(July 1988)* 82 — Graphics demo.

EDPATCH; EDLOADER Reid, Randall. "A patch for a patch." *(February 1989)* 80 — Modify EDTASM for 80 column screen. Correction, June 1989, p.66.

ELECTION Hyre, Leonard. "Election '88." *(November 1988)* 58 — Keep track of election results.

ELEVATOR Nalos, Paul. "Elevators." *(June 1989)* 90

EVENODD Ostrer, Ken. "Odd one out." *(November 1988)* 77 — Drill for even and odd numbers.

EYECATCH Weshenfelder, Rick. "Ad infinitum." *(October 1988)* 87 — Graphics demo.

EZLABELS Kenny, Keiran. "Who ya gonna write?" *(April 1989)* 80 — Print mailing labels.

EZRUN Kolesar, Fred. "EZrun." *(June 1989)* 62 — Auto-run BASIC programs by typing in their filenames.

EZSHOOT Wells, John T. "Space attack." *(August 1988)* 78

FASTDISK Hegberg, Joel. "I/O in the fast lane." *(November 1988)* 75 — Speed up disk i/o.

FILECOMP Weide, Dennis H. "CoCo takes a hint." *(August 1988)* 36 — Program to help you compare disk files for duplicates.

FINANBAS; FINANBIN Nee, William P. "Machine language made BASIC part 2: High finances." *(August 1988)* 137

Find; Findit; Diskdir; Checkdir; Dodir Puckett, Dale L. "KISSable OS-9: Building two handy tools." *(June 1989)* 150

FLEXQUIZ Kenny, Keiran. "Answers for your questions." *(September 1988)* 72 — Quiz game.

FLIGHT Presley, Chad. "Winging it." *(August 1988)* 78

FLIGHTS1-3 Kolar, Joseph. "BASIC training: BASIC bird watching." *(May 1989)* 88 — Creating figure of bird.

FMenu; Mod1; Mod2; DiskFix; FormatFix Puckett, Dale L. "KISSable OS-9: Another cry for standards." *(October 1988)* 147

FONTMSTR Wolf, Eric. "The font master." *(October 1988)* 41 — Replace CoCo3's built-in HPRINT font."

FONTSETR Jones, Edward. "Font selection made easy." *(May 1989)* 68

FORMATTR Larson, Neal. "Mass disk formatter." *(September 1988)* 30

FORTUNE Burnham, Paul D. "The CoCo crystal ball." *(June 1989)* 28 — Fortune teller

FRACTAL Phillips, John E. "The mathematics of chaos." *(March 1989)* 81

FRACTION Blyn, Steve. "Education notes: Fraction action." *(May 1989)* 56

FUNSTATS; RSTRMKR; RSTRFXR; GMFLCHK, etc. Baker, Delbert. "FunStats." *(June 1989)* 110 — Keep statistics for your softball team.

GASQUIZ Blyn, Steve. "Education notes: Motor math." *(July 1988)* 54 — Practice in solving verbal math problems.

GENMENU; PATCHWPL; PATCHWPH; CONVERTL; CONVERTH; MONROE Curtis, H. Allen. "The desktop publisher: A reprise." *(September 1988)* 102

Gfx3 Puckett, Dale L. "KISSable OS-9: Volunteers build a better mousetrap." *(August 1988)* 182

GOLFER Duggins, Larry. "Teed off." *(March 1989)* 58 — Golf game

GRAFTEXT Welsh, Jack D. "Text for graphics." *(May 1989)* 20 — Add captions to pictures.

GRAVGRID Grengs, Patrick D., II. "Warped animation." *(October 1988)* 102 — Create whirlpools and waves in an undulating grid. Correction, January 1989, p.41.

GROCHART Crawford, Gay. "Knee-high to a growth chart." *(February 1989)* 89

GUESSWHO Kenny, Keiran. "Guess who." *(July 1988)* 83

HANOI O'Brien, Dan. "Towers of Hanoi." *(February 1989)* 90

HEADSUP Riley, Russell, Jr. "Boggling your mind." *(February 1989)* 91

HECONOMY Francisco, Harleen. "Economy printer buffer, part 1 of 2." *(June 1989)* 100

HIPMAS Burke, Val. "Have a jazzy Christmas." *(December 1988)* 28 — Christmas music.

HOTCOLD Pucella, Ric. "Hot stuff." *(May 1989)* 76

ILLUSION Morin, Jean-Francois. "Now you see it, now you don't!" *(June 1989)* 48 — Optical illusions.

IMMORTALITY Alger, Paul. "Seeking immortality." *(August 1988)* 76 — Find number of 'men' in a game.

INTEREST Norris, Duke. "Lil' ole interest, revisited." *(April 1989)* 18 — Update of September 1984 article.

INVITE; INVIFORM McCorkle, R. J. "Having a party?" *(May 1989)* 46 — Print invitations, flyers, etc.

ITALICS Francis, David. "Emphasize with the DMP 105." *(August 1988)* 53

JOYZAP Lowry, James Kevin. "Minding your X's and Y's." *(August 1988)* 77

KEYBOARD Plaster, Gip Wayne. "Play your piano." *(December 1988)* 93 — Music demo.

KEYPOWER Sweet, Michael. "Get more power from your CoCo keyboard." *(October 1988)* 72 — Add functions to various keys.

KILLER Dater, Andrew. "The Hit list." *(August 1988)* 87 — Keep track of the body count in role-playing games.

LANDERGG; LANDER Donze, Jeff. "Lunar lander." *(May 1989)* 28

LOADER Goff, Allen. "Showing off random graphics." *(November 1988)* 75 — Correction, January 1989, p.41.

LOCKOUT Knapik, Steve. "Hacker, beware." *(December 1988)* 91 — Disk file protection.

MACVIEW Elmer, Al. "Get the picture?" *(July*

1988) 93 — Program enabling you to view MacPaint picture files on CoCo.

MANDO Musumeci, John. "Now or never." *(January 1989)* 58 — Music and graphics demo.

MAPPER Blyn, Steve. "Education notes: You can't get there from here." *(November 1988)* 40 — Reading exercise.

MATCH Scerbo, Fred B. "Wishing well: Opposite attraction." *(September 1988)* 92 — Concentration-like game.

MATHDRILL Queen, William A., III. "Math drill." *(May 1989)* 76

MATHSHOT Blyn, Steve. "Education notes: Shooting math." *(June 1989)* 76

MEMORY Kenny, Keiran. "What's missing?" *(August 1988)* 79

ML-DATA Miller, Stephen. "ML-Data." *(August 1988)* 100 — Routine to convert machine language program into BASIC.

MLNOTES Nee, William P. "Machine language made BASIC part 9: Let there be music." *(March 1989)* 30

MMDIR Miller, Merle. "Disks name miscl." *(June 1989)* 92

MONO3 Phillips, Charles F. "CoCo 3 green screen blues." *(July 1988)* 83 — CoCo 3 output to monochrome monitor.

MORSE Barden, William, Jr. "Barden's buffer: Hamming it up." *(January 1989)* 145 — Ham radio discussion.

MVShell; SigTestOne; SigTestTwo; SkipMuf Puckett, Dale L. "KISSable OS-9: Sending the right signals." *(July 1988)* 174

NEWSCOST Blyn, Steve. "Education notes: Carrier's collection chart." *(August 1988)* 80 — Interpreting a newspaper delivery chart.

NEWSREEL Kenny, Keiran. "News flash! News flash!" *(December 1988)* 92 — Home news screen. Correction, Feb. 89, p.76.

NOSCROLL Pucella, Ric. "Free zone." *(November 1988)* 74 — Protect area of screen from scrolling.

NOTECARD Seats, Darrin. "Note card." *(May 1989)* 78

NUCOLORS; DEMO Cutchin, Rusty. "Breaking the four-color barrier." *(October 1988)* 51 — Add many more than 4 colors in HSCREEN 4.

OFFICE Clapper, David L. "Invoice innovation." *(April 1989)* 44 — Create professional-looking invoices and labels.

ONE; TWO; THREE; FOUR McKernan, Chris. "Escape from Tut's tomb." *(July 1988)* 58 — Arcade game written in machine language.

OPOSITE1 Scerbo, Fred B. "Wishing Well: Matching opposites." *(August 1988)* 92 — Basic vocabulary for elementary students.

OPOSITE2 Scerbo, Fred B. "Wishing well: Two for the price of one." *(October 1988)* 90 — Continuation of last months 'opposites' game.

PAGER Nee, William P. "Machine language made BASIC part 4: Getting graphic." *(October 1988)* 48

PAYASO Rodriguez, Ana M. "CoCo clowns around." *(September 1988)* 74 — Clown graphics.

PENTPUZL Barden, William, Jr. "Barden's buffer: The puzzling pentomino." *(December 1988)* 164

PETSTORY Blyn, Steve. "Education notes: Animal stories." *(March 1989)* 28 — Language arts program for elementary school children.

PICTURES Scerbo, Fred B. "Wishing well: Growing up with CoCo." *(November 1988)* 146 — Building on skills developed in earlier games.

PIECHART Wolf, Eric. "Chart plotting made easy." *(January 1989)* 44 — Draw multi-color pie charts from self-entered data.

POINTBAS; POINTBIN Nee, William P. "Machine language made BASIC part 5: Get the point." *(November 1988)* 80

PONGBIN; PONGBAS Barden, William, Jr. "Barden's buffer: Assembly language for the complete novice part 2." *(October 1988)* 132

PORTRAIT Tatarka, James A. "A tribute to the CoCo2." *(June 1989)* 22

PRESDENT Miller, Ralph D. "Washington, Adams, Jefferson...." *(November 1988)* 102 — Presidential drill.

PRNTLINE; LINETABL; ANALYZE Barden, William, Jr. "Barden's buffer: Can you survive this column." *(August 1988)* 170 — Assembly language interrupts and BASIC internals. Correction, October 1988, p.84.

PROG1; PROG2; PROG3; PROG4 Dowd, Kevin. "The little graphics library." *(August 1988)* 102

PROS1; PROS2; SCRN1; SCRN2; MAKEPROS Chapel, Lee J. "For the love of gold." *(December 1988)* 58 — Adventure game. — Correction, April 1989, p.48.

PSYCHIC Halbrook, Travis. "May the force be with you?" *(July 1988)* 85

PSYCHO Abraham, Alex. "Psychedelia." *(January 1989)* 61

PULSBEAT Maxwell, Wilmer B. "Looking for a heartbeat." *(July 1988)* 84 — Estimate pulse rate.

PUZZLE1; PUZZLE2, etc. Barden, William, Jr. "Barden's buffer: Perplexing puzzles." *(June 1989)* 140 — 'Perplexing puzzles to ponder.'

Pr Ries, Richard. "PR.BO9." *(June 1989)* 136 — Print utility for OS-9.

QLATOR Scerbo, Fred B. "Wishing well: From keyboard to keypad." *(March 1989)* 84 — Simulate a numeric keypad.

RAMDISK; COPY Jimenez, Daniel. "Program a RAM disk." *(January 1989)* 110 — Correction, April 1989, p.48.

REACTION Kenny, Keiran. "Left beats right." *(June 1989)* 89

REFERNCE Blyn, Steve. "Education notes: Locating the topic." *(September 1988)* 136 — Cross refernce drill.

REMOTE3; BASLOAD; REMDEMO Alger, Paul. "A REMOTE update." *(November 1988)* 110 — Update to BBS system.

RGBDEMO Jenkins, Dave. "An RGB demonstration." *(January 1989)* 65

RINGBELL Bernico, Bill. "We have a winner!" *(January 1989)* 87 — Results from July's programming contest.

ROMANMRL Weaver, Dan ; and Weaver, John. "When in Rome." *(September 1988)* 71 — Learn Roman numerals.

ROOMMATE Turner, David. "Bills, bills, bills!" *(October 1988)* 14 — Program to help roommates organize expenses.

ROTATE3D; DRIVER; ALTOROTAT Nee, William P. "Machine language made BASIC part 11: 3-D without glasses." *(May 1989)* 82

SCRLDEMO; FASTSCRL Mitchel, Barry J. "All the right moves." *(December 1988)* 116 — Correction, April 1989, p.48. — Faster graphics.

SCRNLIST Bernico, Bill. "ML addresses." *(July 1988)* 82

SCRNSAVE Jones, Paul E. "Save that screen." *(December 1988)* 108 — Clears monitor screen to black if no key pressed.

SEATCHRT Turowski, Donald A. "A seat for everyone and everyone in his seat." *(September 1988)* 45 — Seating chart for classroom.

SEAWAR Hameluck, Jeff. "Sea War." *(August 1988)* 20

SELECTON; BUBBLE; SHELL; QUIKSORT Barden, William, Jr. "Barden's buffer: Sorting it all out." *(November 1988)* 160 — Describes how to make computer sort items.

SEPARATE; RITEREAD; TIMER; CREATE; ADDRECRD Perlman, Richard. "Designing your own money management system." *(March 1989)* 88

SHIFTS Nee, William P. "Machine language made BASIC part 8: And more math." *(February 1989)* 96

SIMON Massie, Warren. "CoCo says..." *(February 1989)* 89

SIMPLDRA Day, Darren. "Simple draw." *(June 1989)* 93

SINGCARD Kastack, Rebecca. "The singing card." *(December 1988)* 112 — Send a musical holiday greeting.

SLOTCORE Bernico, Bill. "BASICally speaking." *(March 1989)* 130 — Game hint; BASIC tutorial, etc.

SLOTS Carlin, Kenneth. "Taking on the one-armed bandit." *(October 1988)* 88

SNDCTRL Hegberg, Joel. "Sound control." *(June 1989)* 92

SOLTAIR3 Quellhorst, George. "Solitaire, the next generation." *(December 1988)* 36 — 'Adding color to solitaire on the CoCo3.'

SORTBAS; SORTBIN Nee, William P. "Machine language made BASIC part 1: General Math." *(July 1988)* 100

SOUNDOFF Hufford, Wayne. "The timer." *(May 1989)* 75 — Timekeeper for games.

SPELLER; ROMRAM; SETHELP; TAKETEST Johnson, Samuel D. "EduSpell." *(December 1988)* 42 — First in a series developing a talking, spelling tutor.

SPOOK Moos, Patricia. "Fright night." *(October 1988)* 86 — Pumpkin graphic.

SPOOLBAS Genois, Marc. "CoCo3 printer spooler." *(May 1989)* 86

STARVIEW Hill, Kenneth R. "An uncommon view." *(April 1989)* 81 — Graphics demo

STATES Cooper, Rick. "States and capitals." *(September 1988)* 60

STOCKS3; STOCKS2 Webb, Mark. "Playing the stock market." *(November 1988)* 45

STORM Bryson, B. J. "The storm." *(June 1989)* 59

SUBDEMO; REALMENU; MARBLE1; MARBLE2 Perlman, Richard. "The do-it-yourself database: Subroutines and program code." *(February 1989)* 36 — First in a series of tutorials

SUPRSTMP; STMPDEMO Spiller, Jeremy. "Super stamper: The elastic rubber graphics stamp." *(October 1988)* 28 — Two new graphics commands for PMODE image manipulation.

SetDate Ries, Richard. "What day is it?" *(February 1989)* 142 — Utility to change format of date.

TACHISTO Blyn, Steve. "Education notes: The blink of an eye." *(February 1989)* 105 — Increase students' memorization abilities.

TAFFYBAL Babich, Tio. "Like pulling taffy." *(January 1989)* 60 — Graphics demo.

TAPCNV; BASFIX Hutchison, Don. "Working together: Delphi and tape I/O." *(August 1988)* 156 — Two utilities to help download programs using Modem Pak.

TELE-DIR Rochford, Tom. "Who you gonna call?" *(January 1989)* 64

TIMECARD Scerbo, Fred B. "Wishing Well: How much time?" *(April 1989)* 89 — Calculate differences in time.

TOADER Dunn, Christopher. "It's a toad's life." *(February 1989)* 43

TRAKSAT; ECHO.SOURCE; MAKE.ECHO Puckett, Dale L. "KISSable OS-9: Moving to OS-9." *(March 1989)* 136

TREEPUZZ Moore, Mike. "The Christmas tree puzzle." *(December 1988)* 20 — 'Can you plant the royal Christmas trees as the king desires?'

TURKISH Cooper, Rick. "Setting for one." *(December 1988)* 90

USEDCARS Johnson, Richard. "Stalking the used car." *(September 1988)* 16 — Used car shopping guide.

VIDTIME Hair, Fred, Jr. "On VCR time." *(September 1988)* 122 — Calculating time intervals for VCR tape.

WEEKDAYS Scerbo, Fred B. "Wishing well: Just say goodnight Gracie." *(June 1989)* 87

WHENRAIN Cooper, Rick. "Today's forecast." *(April 1989)* 82 — Graphics demo

WILDBIN Estrado, Richard. "Selective directory listings using wildcards." *(June 1989)* 122

WILFLOAT Abell, James. "Does Archimedes' discovery hold water?" *(March 1989)* 82

WORDCNT Kastack, Rebecca. "Counting the words." *(January 1989)* 62

WORDMAKE Bleckley, Logan, III. "Wordmake." *(June 1989)* 91

WORLD Bernico, Bill. "Buy a CoCo and see the world." *(September 1988)* 70 — Map of the world.

WORMDRVR; WORMSMPL Barden, William, Jr. "Barden's Buffer: Food for worms." *(February 1989)* 144

WRITE3ô Bates, Larry E. "Write III plus." *(July 1988)* 96 — Add embedded printer commands to Write III (April 87, p.156).

XMRECV.ASM; XMSEND.ASM; XMRECV.SYS; XMRECPK.BAS, etc. Grubb, Robert John. "CoBBS Xmodem routines." *(November 1988)* 88

Xcodes.CC3 Puckett, Dale L. "KISSable OS-9: Better tools are here!" *(December 1988)* 178

YULELOG Davies, Peter E. "Holidays at the hearth." *(December 1988)* 89

ZHAGWHAR Schuler, Keith. "Castle Zhagwhar." *(June 1989)* 41

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Okotoks	Okotoks Radio Shack
Peace River	Radio Shack Associated Stores
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St. Paul	Walter's Electronics
Stettler	Stettler Radio Shack
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Burns Lake	VT. Video Works
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	Four Corner Grocery
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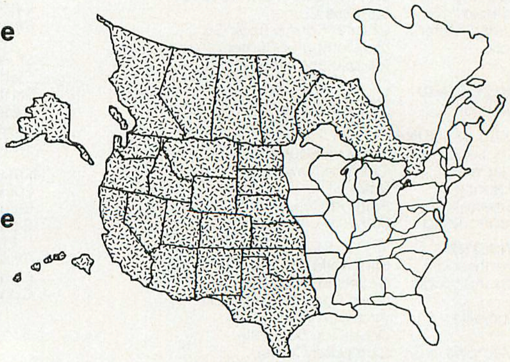

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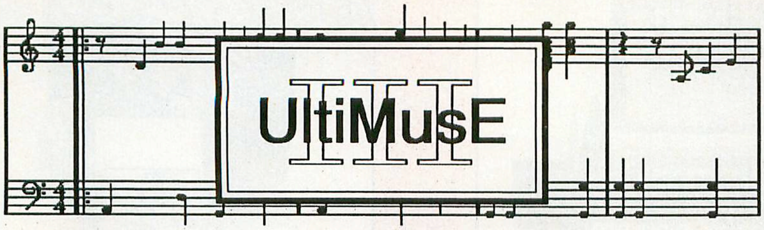

"What if...

all CoCo music software programs were this good?"

UltiMusE III (the Ultimate Music Editor, CoCo III) is a MIDI 'Notation Sequencer'. It lets you write and edit sheet music on a 640x192 graphics screen using the mouse, play it on ANY MIDI-equipped synthesizer(s), and print out the score... Written by an experienced computer professional who is also a serious amateur musician and composer. With **UltiMuse III**, there is no more 'faking' to play what you want to hear! Perfect for the trained musician, **UltiMusE III**'s natural notation also helps a beginner to copy a favorite piece of sheet music just as it looks. Why should your music sound like a machine? **UltitMusE III** has a wide pitch range, from 4 octaves below Middle C to over 3 above. Each staff has a 4-octave range centered on one of four clefs - Treble, Guitar, Bass, and Double Bass. Staff placement, clefs, and part and MIDI channel assignments can ALL be edited... Professional software should use a professional Operating System. **UlitMusE III** uses the advanced features of OS-9 Level II and does not interfere with its windowing and multi-tasking in any way.

NEWS FLASH...

UltiMusE III was a complete SELL-OUT at the 1989 Chicago RAINBOW*fest*.

SYSTEM REQUIREMENTS

CoCo III with at least 256K memory & OS-9 Level II
Mouse or Joystick. Hi-Res Joystick Adapter recommended
Synthesizer(s) with MIDI-In jack, plus serial cable
Tandy Dot Matrix Printer and a MIDI Interface Pak & Multi-Pak Interface are optional

---

UltiMusE III $54.95

Start OS-9 (Book & Disk)	$32.95
Basic Screen Editor	$19.95
Check-09MV	$25.95
A-DOS 3	$34.95
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BackUp Lightning	$16.95
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WORD SEARCH: $22.95
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Fast action arcade game that will test your skill and reflexes! Program allows you to save or load in your high scores and is CoCo 1, 2 & 3 Compatible. 32k Disk

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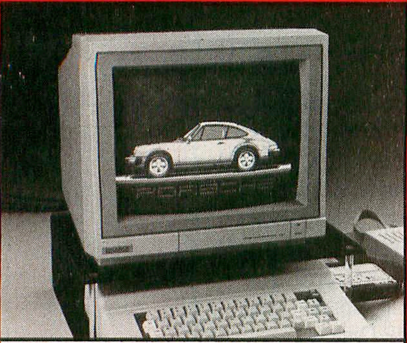

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- Use with Coco, Tandy 1000's, IBM PC

CC-3 RGB cable 19.95
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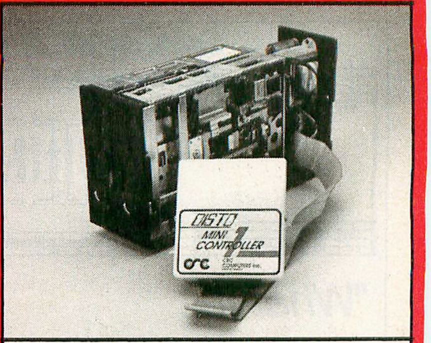
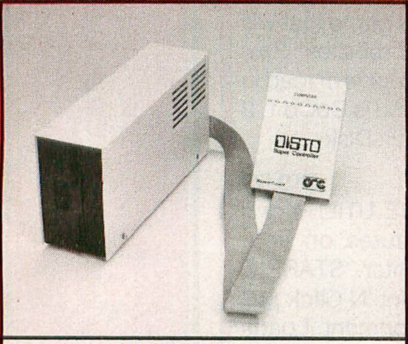


DOUBLE DRIVE 0 +

- Two double side 360K Teac 55B
- Disto controller & cable

$310 (8 ship)



DRIVE 0 PLUS

- Double sided 360K MPI 52
- Disto Controller and cable

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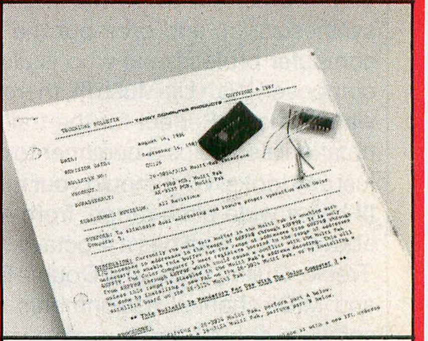
STAR NX-1000R COLOR

- Built in back tractor paper feed
- Joe Walker Star Max Color printer driver and SP-C converter add $40

$249 (5 ship)



PAL UPGRADE PAL - 1 or 2

Makes multi-pack interface work with CoCo 3. Specify 26-3024 or 26-3124.
$14.95 (2 ship)

A. **DISTO** 3 in 1 Board	$59.45
B. **DISTO** MEB	$30.00
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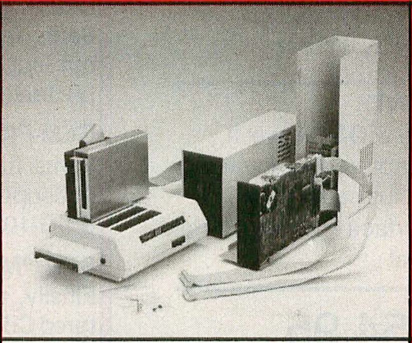

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20,000,000 Bytes or the equivalent to 125 R.S. 501's on line are packed into this hard drive, pre installed and ready to run. This complete, easy to use package includes a Seagate 20 Meg Hard Drive, a DTC 5150 Controller and interface*, heavy duty case & power supply, and a 1 year warranty. This 20 meg Hard Drive will also work with Tandy and IBM clones. Basic driver, $29.95, lets you access this hard drive without need for OS-9.
(9 ship)

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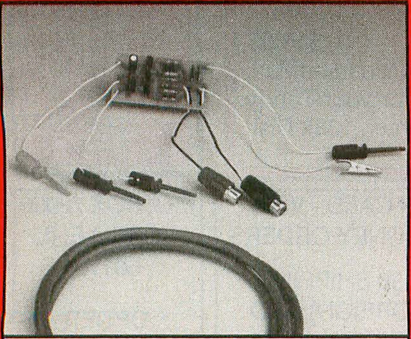
HD-3	40 Meg	$598

*Burke & Burke



VIDEO AMPLIFIER VA-1

required in CoCo 1 or 2 to drive monitor
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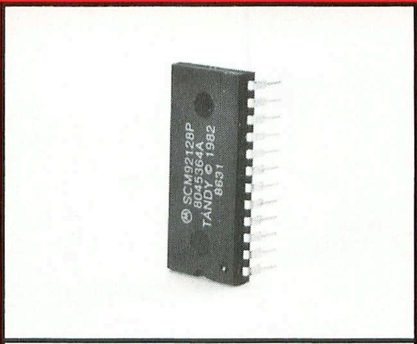
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- Works for CoCo 2 or 3

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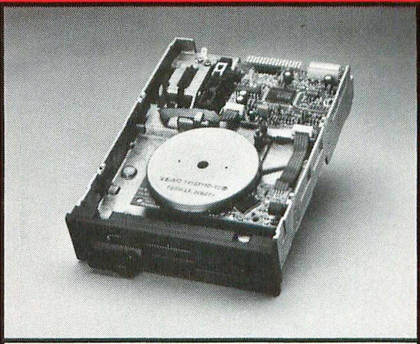

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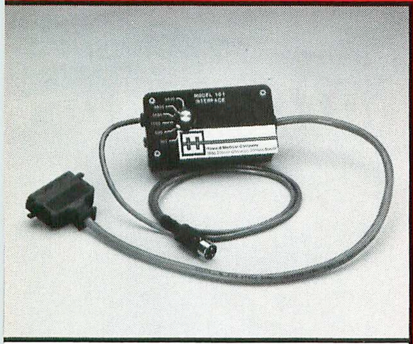
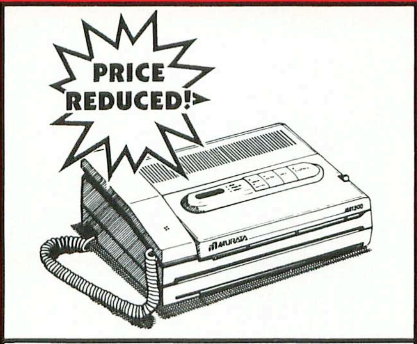


HOWARD SP-C

- Serial to Parallel Converter
- Connect CoCo to Parallel Printer

$68.45 (2 ship)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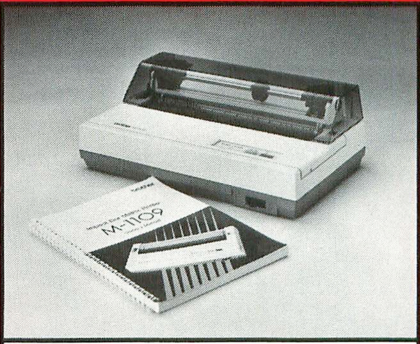

BROTHER M-11 PRINTER

- Built-in Serial & Parallel Interface
- Dot Matrix: Tractor/Fricton Feed

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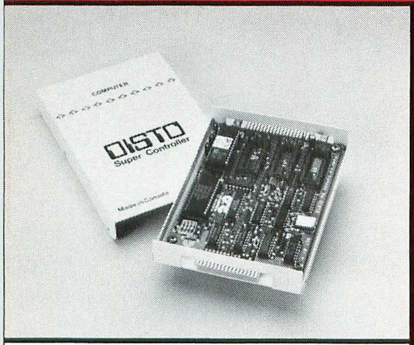
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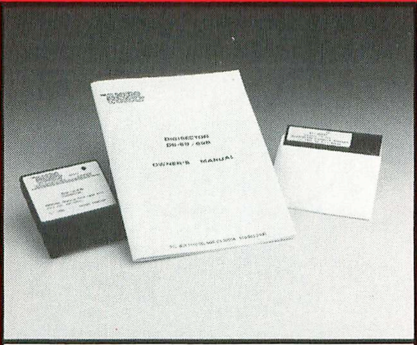

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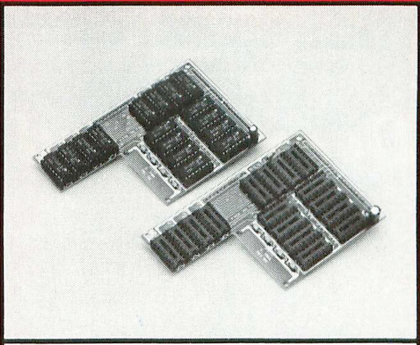

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• 512K Bare Board	$40
• Populated 512K & Software	$119
• 64K 8 Chip for CoCo 2	$30

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DISTO DC-7

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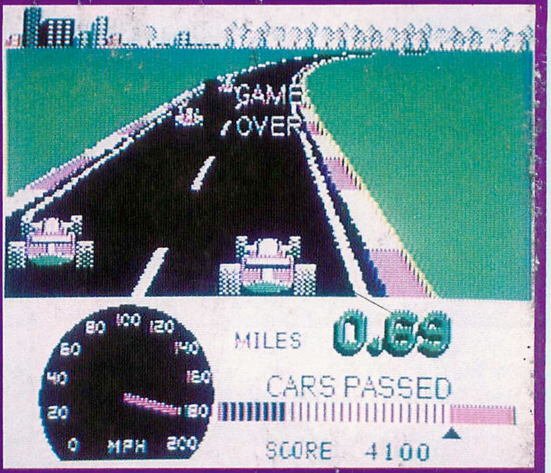
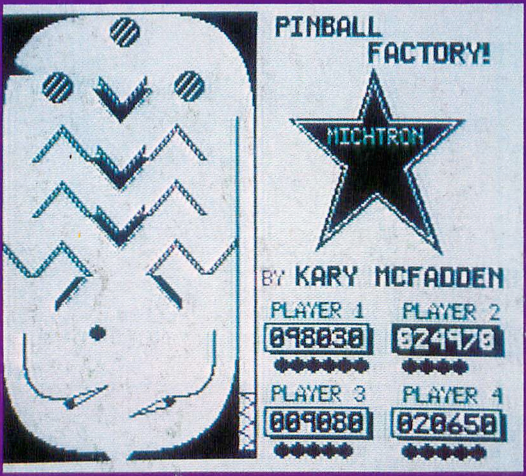
Speed Racer



As the checkered flag drops your pulse rises in this lively arcade game. The road twists to the horizon on the 3-D panorama that sets the stage for exciting racing. Vie for time as you glide through the curves at incredible speeds. Step through the gears to stay ahead of the pack, but be quick! Some will stop at nothing to see the end of the race, or the end of you! Four challenging raceways, complete with obstacles and colorful 3-D scenery test your skills in this Pole Position™ type game.

32K Color Computer required...$34.95

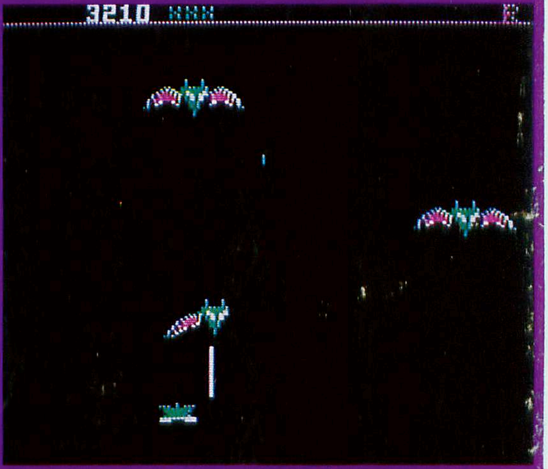


Pinball Factory

Video games come full circle in this tribute to the original arcade game, *Pinball.* Classic pinball springs to life as never before, with fresh new angles that only a computer can offer. Crisp graphics, sound, and fast smooth action give this machine-language arcade game a realistic, responsive feel you'll hardly believe. There are even "tilt" buttons that let you "bump" the machine. In addition to playing a great game of pinball, you can enjoy hours of creative pleasure as you design, build, edit, and play your own screens.

64K Color Computer required...$34.95

Demon Seed



The first waves of flying, diving, bloodthirsty bats are arriving. Move, fire, and move again. It's a never ending battle. If you are lucky enough to defeat the bats, be ready for a much greater challenge, The *Evil Demons* themselves. Destroy a wing and another takes its place. Only a direct hit can save you now. It will take great skill to triumph. If you do, then you better be ready for the *End*. The Demon Flag Ship descends to destroy your remaining ships. Your only hope is to penetrate the hull, break through the shield, and destroy the dreaded Gargoyle.

32K Color Computer required...$19.95

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